APPENDIX A

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Provisional Patent Application

for

KNOWLEDGE MANAGEMENT AND INFORMATION DEPLOYMENT SOFTWARE SYSTEM

INVENTORS

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Introduction

1.1 Purpose

This document discloses software system requirements for a preferred embodiment of the Interneer software system.

1.2 Scope

This document comprises the software requirements specification (SRS) for the Interneer product.

1.3 Definitions, Acronyms, and Abbreviations

Annotate	Ability to add a single unit of information to another existing unit of information
Criticality	Relative importance of individual requirements.
Codify	Organize
Engineer	Mechanical Engineers, Manufacturing Engineers, Aerospace Engineers, Civil Engineers, Structural Engineers, Engineering Managers, Project Coordinators, and Technicians.
Embedded Knowledge	Knowledge embedded in the processes and products that people create.
Embodied Knowledge	Knowledge embodied in people and social networks.
Identifier	Unique identification of each requirement.
Information	Text, charts, equations, figures, tables etc. available in a tangible form e.g. electronic, print etc.
Knowledge	Information with significant human value added.
Open Knowledge Environment	Core Phenom knowledge base.
Phenom	Interneer "Internet Aided Engineering" product suite.
Rationale	Reason for requirement. (Should also serve to preserve context and assumptions)
Responsible Individual	Responsible for performing impact analysis should requirement change.
Source Document	Provides link between source of requirement (e.g. end user specifications) and requirement.
SRS	Software Requirement Specification
Tacit Knowledge	Embedded and Embodied Knowledge.
Taxonomy	A division of files into ordered groups or categories -- defines how data is stored and accessed in the database
Unit	Single instance of information.
URL	One or more units.
User	Engineers and Vendors.
Verification	Method to be used to demonstrate requirement was achieved.

Method	(Analysis, test, inspection, or demonstration)
Vendor	Procurement Agents, Parts Suppliers, Project Coordinators, Engineering Managers, Manufacturers, and Engineering Consultants.
Workflow	Definition of a sequence of steps through URLs.

1.4 References

1.4.1 XML

www.xml.org

1.4.2 Architecture, Engineering, and Construction XML Working Group

www.aecXML.org

1.4.3 The Windows Interface Guidelines for Software Design

Microsoft Corporation
One Microsoft Way
Redmond, Washington 98052-6399

2 General Description

2.1 Product Perspective

Phenom will implement an online product suite initially serving the design and analysis needs of the mechanical engineering community. From product concept to final procurement Phenom's platform will cut engineering costs and product time to market by delivering Internet Aided Engineering software tools. These tools, and all the functionality contained herein, although especially useful in engineering, can be broadly applied to other industries with the same affects. For the purpose of simplicity, the rest of this document is written with the specific application of engineering in mind.

This online solution will provide access to essential mechanical engineering information, guidelines, and procurement resources and will facilitate the capture and leveraging of internally generated engineering knowledge. Phenom's revenue will flow from software license fees, vendor commissions, and ASP offerings.

Through a unique combination of online knowledge, workflow, and community management, Phenom will dramatically increase both efficiency and effectiveness. As a result, the process of mechanical engineering (and later processes in other information intensive industries) will become far more cost effective, while simultaneously benefiting from an overall increase in quality.

2.2 Product Functions

The Phenom product will address the following areas of functionality:

- Knowledge Management,
- Collaboration & Project Management, and
- Community management.

2.2.1 Knowledge Management

Information, in combination with an understanding of how to apply that information to the solution of a real-world problem, is generally recognized as being knowledge.

Conversely, in the particular case of Phenom, information is knowledge that has been reduced to some tangible format. In its simplest form, information relevant to Phenom may be in printed or electronic format. This information contains a great deal of embedded knowledge – knowledge not explicitly written out, but that can be extracted with careful consideration and some reading between the lines. Additionally, users will be able to combine their own understanding and insights with their interaction with the information to engender embodied knowledge.

The ability to capture, organize, and navigate information is an essential component of the Phenom "Internet Aided Engineering" solution (later extended as mentioned above – for example "Internet Aided Accounting", "Internet Aided Pharmaceuticals", "Internet Aided Genetics", etc.). Some of the major benefits of this class of functionality include:

- **Facilitating the use of Best Practices**

  Provides engineers with hints, insights, and starting points in their design and analysis activities. These best practices come from a number of sources including books, personal journals, websites, and experienced engineers. Given that this knowledge comes from disparate sources, there exists a need for their accumulation and intelligent distribution on a common platform. Phenom is that platform.

  This knowledge can simply be information, or it can be in a less tangible form such as embodied or embedded knowledge. In any case, Phenom will provide a means of capturing and navigating through the knowledge in an intelligent manner, taking advantage of the way it is captured and codified. With this product, engineers will no longer need to spend enormous amounts of time searching for their answers or reinventing the wheel.

- **Leveraging Adaptability**

  As technology advances, new knowledge is produced and existing knowledge sometimes becomes obsolete. This continues to be a source of great challenge to technical publishers. The Internet, to a large extent, relieves this shortcoming by allowing for real time adaptation. The Phenom databases will be continually updated and expanded to reflect the most current advances and best practices in engineering – updates and expansions will come both from Interneer staff members and Interneer customers. Because of this, companies using Phenom will have a significant advantage over traditional technical publishers. Also, as more and more content is added, Interneer gains economies of scale and hence erects additional barriers to entry for competing firms.

- **Providing Focused Visibility into Intangible Assets**

  Engineering firms aren't always capable of seeing their own weaknesses. By tracking

their engineers' activities, engineering managers can determine areas of strength and weakness in their firm's knowledge resources. This provides the ability for them to staff up in areas they feel they need to improve, along with invaluable insight to how their engineers work.

- **Virtual Workspace**

  Phenom provides access to powerful software tools and information wherever a user can connect to the Internet. Not only will engineers have a virtual briefcase full of their personal engineering knowledge for life, but also teams of engineers can interact and share critical knowledge independent of geographic location.

Just as the ability to manage information is a cornerstone of the Phenom product, the need to manage tacit knowledge is absolutely essential. The value of tacit knowledge is often orders of magnitude greater than that of information.

Not only is the process of identification and capture of tacit knowledge notoriously difficult, but it can be quantified only by the "producer" of that knowledge. Therefore, it is mandatory that the Phenom product provides a means by which an engineer can identify and capture their tacit knowledge.

Although captured information may encompass "dynamic" knowledge processes, such as an interactive equation, there's also a need to associate these incremental business processes into larger workflows. It's in the animation of these "captured" workflows that Phenom will deliver its greatest gains in productivity and quality.

2.2.1.1 Capture

2.2.1.1.1 Information

In order to work with information that exists in a tangible format (i.e. electronic, print etc.), it will be necessary to provide a means for the identification and capture of it. Properly captured, the information becomes much easier to codify. Once properly codified, the information is transformed into a powerful tool that can be leveraged to suit the needs of engineers. The capturing of information includes a review process, which filters out unusable information.

2.2.1.1.2 Tacit Knowledge

2.2.1.1.2.1 Annotation

Annotations are units of information attached to other existing units of information. They support the ability to capture and codify tacit knowledge. Knowledge captured through annotation becomes information. This knowledge, which is embodied in engineers' minds and embedded in the processes they use, is immediately captured as they use Phenom. By capturing and codifying tacit knowledge in annotations form, Phenom ensures that knowledge that was once hard to access, is now well leveraged and easily accessible.

2.2.1.1.2.2 Workflow

Although annotations allow for the capture of tacit knowledge, there is a greater need to capture more complex knowledge in the form of workflows. A workflow describes a series of associated steps that define a guiding process that explains how to conduct a task. This form of tacit knowledge is very important to capture and leverage since it usually represents guidelines and

rules of thumbs: essentially shortcuts that experienced engineers take to save time in their daily work. While capturing a workflow, a user is able to define an entire engineering design process. Once it is captured, the knowledge becomes information that is now codified or organized. A review is also included which ensures only filtered knowledge is allowed.

2.2.1.2 Codify

2.2.1.2.1 Information

All captured information must be codified and thus facilitates the easy access to and interaction with best practices. This is the process by which a structure of relationships between information and information identifiers that locate the information are established. This "information architecture" or taxonomy will support and simplify the interaction with, and access to, captured information since it provides the blueprint for the information structure.

2.2.1.2.2 Tacit Knowledge

2.2.1.2.2.1 Annotation

All information captured via annotation is automatically codified since it is captured in context: The engineer annotates when they are interacting with information on Phenom.

2.2.1.2.2.2 Workflow

Workflow processes will need to be codified properly and associated with the information taxonomy in order to reap the benefits of quick and easy access.

2.2.1.3 Leverage

2.2.1.3.1 Information

The ability to leverage captured and codified knowledge is the main benefit in knowledge management, leading to tremendous timesaving, increased efficiency and reduced frustration. The leveraging of information is conducted by using the Phenom technology to optimize access and interaction with codified information.

2.2.1.3.2 Tacit Knowledge

2.2.1.3.2.1 Annotation

Annotations are tightly coupled with their associated captured information. Navigation and leverage of this class of information will differ from typical captured information in the sense that it will not be accessible via the taxonomy, but through its relationship to the former. Annotations are optimally leveraged through Phenom since they are presented to the right user, who is interested in the captured information, at the right time, when they are interacting with the captured information.

2.2.1.3.2.2 Workflow

Animating the captured workflow is an important way to facilitate leveraging of knowledge after capturing it. It essentially provides a snapshot view into the experienced engineer's mind that created the workflow. By providing this functionality, Phenom then ensures an effective technique of leveraging tacit knowledge.

2.2.1.3.2.2.1 Animation

This is the process of making steps within a workflow interactive. The ability to animate a workflow provides an optimal means to leverage tacit knowledge.

2.2.1.3.2.2.2 eJournal

eJournal provides the ability to bookmark a work step of a workflow at any discrete moment in time and allows the engineer to keep track of their work in real time as they interact with the workflow. Also, the eJournal allows the engineer to restore their bookmarked work step at any

moment in time and allow the information to be transferred to other parts of a workflow. The eJournal saves engineers time by not requiring them to repeat work steps.

2.2.2 Community Management

The Phenom product leverages the unique ability of the Internet to facilitate communication between large and disparate user communities. It will be necessary to define and manage a multiple communities and combinations of communities. In particular, it will be necessary to define and manage a "core" community, which shares all system resources together with subsets of that community that will share and possibly "publish" private resources to the larger community.

2.2.2.1 Define a Community

It will be necessary to be able to create and modify communities, which may contain valid registered users of the system. The ability to add or remove members to or from a community will be required.

2.2.2.2 Publish

Members of an individual community will be able to publish content to their respective communities. That content will remain private to the "owning" community. If desired, an administrator of a community may choose to publish content to one or more additional communities, including the core Phenom community. Ownership will remain with the originating community.

2.2.3 Collaboration, Procurement & Project Management

Collaboration and project management together encompass a large area of functionality within the Phenom software.

2.2.3.1 Collaboration

Phenom will allow online collaboration between users in different departments in an organization, cities or countries. Collaboration is in the form of real time information sharing and online meetings.

2.2.3.2 Procurement

Engineers on Phenom will have the ability to connect with vendors and products at the end of a full design process. The products presented will be based on the designs they conduct. The connection will allow engineers to purchase the desired product online or to collaborate with them.

2.2.3.3 Project Management

Managing projects on the Phenom platform is fundamental in making the design process efficient. Users can organize projects based on teams, goals, and assemblies with full access control, hence providing a virtual platform for users to work collaboratively online.

3.1 External Requirements

3.1.1 Internet Enabled

3.1.4 Interface Integrity

3.2 Functional Requirements – Knowledge Management

3.2.1 Capture
3.2.1.1 Information
3.2.1.2 Tacit Knowledge
3.2.1.3 Annotation
3.2.2 Codify
3.2.3 Leverage
3.2.3.1 Search – Without Taxonomy
3.2.3.2 Search – Within Taxonomy
3.2.3.3 Annotation
3.2.3.4 Expert Guidance System

3.3 Content Requirements

3.3.1 Industry Standard Content
3.3.1.1 Information
3.3.1.2 Tacit Knowledge

3.5 Functional Requirements – General

3.5.1 Analysis
3.5.1.1 Solve equations on the site
3.5.1.2 Solve for any variable in equation
3.5.1.3 Chart relationship between two variables in equation
3.5.1.4 Chart relationship between three variables in equation
3.5.7 Online Journal
3.5.7.1 Automatic Storage
3.5.7.2 Journal Data Encrypted
3.5.7.3 Journal is Searchable

2.3 User Characteristics

The anticipated Phenom user community can be divided into the following general groups:

- Mechanical Engineer
- System Administrator

It is assumed that a mechanical engineer will have completed all educational requirements of the profession, in addition to possessing a high degree of computer literacy.

2.4 General Constraints

The Interneer product must be able to exchange information with external systems via XML, and AECXML. As a result, it will be subject to any and all limitations inherent in each of these protocols.

The Interneer product must conform to all applicable industry standards of system security and data integrity.

2.5 *Assumptions and Dependencies*

It is assumed that current market trends will persist throughout the development and deployment stages. As envisioned, this will be an Application Service Provider (ASP) product, deployed and accessible only over the Internet and through an Internet browser.

3 Specific Requirements

3.1 *External Requirements*

3.1.1 *Internet Enabled*

Identifier	
Description	Must be accessible through the World Wide Web and across and intranet.
Rationale	Interneer is relying on the interactivity and accessibility of the Internet to provide up-to-date and real-time resources for engineers. Also some customers may prefer an intranet solution.

3.1.2 *XML Interface*

Identifier	
Description	System Integration must be using XML and AECXML.
Rationale	Adopting an industry standard interface protocol will: 1. Minimize the effort required to implement a solution, 2. Maximize the ability to interface with external systems, 3. Facilitate communication with other vendors via a complete and detailed specification, and 4. Promote the implementation of a robust solution based on the design work of accepted industry knowledge experts.

3.1.3 *Industry Standard Data Definitions*

Identifier	
Description	Information exchanged between Phenom and external systems must adhere to industry standards. In particular, identifiers for parts and/or assemblies must conform to industry standards.
Rationale	Adopting an industry standard identifiers will: 1. Minimize the effort required to implement a solution, 2. Maximize the ability to interface with external systems, 3. Facilitate communication with other vendors via a complete and detailed specification, and 4. Promote the implementation of a robust solution based on the design work of accepted industry knowledge experts.

3.1.4 *Interface Integrity*

Identifier	
Description	Information crossing the system boundary must be subject to the same business rules (including access control and auditing) as internal methods of information exchange.
Rationale	By definition, if multiple implementations of a business process are attempting to access or modify a common set of data according to

	the same business rules, the results cannot be guaranteed to be the same. Even if the data is skewed only slightly, the cumulative effect can be disastrous. In addition to the obvious increase in data integrity, the corresponding reduction in the amount of resources required to properly validate system functionality absolutely dictates this requirement.

3.2 Functional Requirements – Knowledge Management

3.2.1 Capture

3.2.1.1 Information

Identifier	
Description	Must be able to identify and capture information in a manner that facilitates the ability to then codify and leverage it. In order to work with information, it will be necessary to provide a means for the identification and capture of it. Since this type of knowledge can be found in many formats and configurations, responsibility for the identification and parsing of relevant information will lie beyond the boundary of the Phenom product. Capture will accommodate electronic media only.

3.2.1.1.1 Navigate

3.2.1.1.1.1 There must be a mechanism by which candidate information may be located.

3.2.1.1.2 Identify

3.2.1.1.2.1 There must be a means by which candidate information may be uniquely identified.

3.2.1.1.3 Capture

3.2.1.1.3.1 Information that has been located and uniquely identified must be brought within the Phenom system boundary.

Information can be brought within the system boundary by value or by reference. If information is to be accesses by reference, then a means by which it can be located must be captured (i.e. URL, user name and password, etc.).

3.2.1.1.3.2 Any member of the targeted user community must be able to capture information in a consistent and reliable manner.

Through the use of a controlled user interface, information will be entered into the system according to predefined "expert templates" designed to implement rules of format, suitability of content, and context.

It is critical that a simple and intuitive class of template functionality be defined and implemented.

3.2.1.1.3.3 All information must be captured into a Phenom container.

All information within the Phenom system will be stored within a uniquely identifiable instance of a container.

3.2.1.1.3.4 Information may contain other information.

Each instance of information may, in turn, contain one or more instances of information.

3.2.1.1.4 Submission

3.2.1.1.4.1 All information captured into the Phenom system must be submitted to a review process.

3.2.1.1.5 Review Process

3.2.1.1.5.1 It is mandatory that an editorial review and publication process be applied to all captured candidate information.
This is critical to ensure that the overall quality and fidelity of the knowledge base remains high.

3.2.1.1.6 Community

3.2.1.1.6.1 Captured information belongs to (is owned by) one user and, optionally, by one or more user communities (to which the user must belong).

3.2.1.1.6.2 By default, information belongs to (is owned by) the user who captured it, and not their user community.
Users must have the ability to capture their expertise and publish it to other users within their user community (i.e. other members of the user's company, business unit, organization, etc.).

3.2.1.1.6.3 Captured information must be private, secure, and protected.
Interneer must guarantee privacy and protection of all captured trade secrets and Intellectual Property.

3.2.1.1.6.4 Private information (i.e. not belonging to the core Phenom user community) may be submitted to Interneer for review and possible publication to the core Phenom user community.
By allowing users to contribute to the core knowledge base, Interneer will grow organically and become an Open Knowledge Environment.

3.2.1.1.7 Branding

3.2.1.1.7.1 Information submitted for publication to the core Phenom knowledge base, if approved, will be branded (i.e. information will be "tagged" - corporate logo, etc. - to identify the submitting user community – company, organization, etc.).
User community exposure (i.e. contributing company, organization, etc.) will act as an incentive to the submission process.

3.2.1.1.8 Scalability and Reliability

3.2.1.1.8.1 Interneer must implement an infrastructure capable of handling the anticipated response and storage demands of its targeted customers.
This is critical to ensure scalability and reliability.

3.2.1.2 Tacit Knowledge

Identifier	
Description	Must support the capture of tacit knowledge. Provides the ability to capture embedded and embodied knowledge in the form of a workflow.
Rationale	The ability to capture expertise – which exists in the form of tacit knowledge – completes the set of knowledge capture functionality.

3.2.1.2.1 Navigate

3.2.1.2.1.1 There must be a mechanism by which instances of captured information may be located.

The capture of tacit knowledge is essentially the capture of a work process that relies upon one or more instances of information. By establishing an association between these instances of information, it's possible to define a coherent sequence of steps to be traversed in the process of solving an engineering problem.

3.2.1.2.2 Identify

3.2.1.2.2.1 There must be a means by which an association of instances of captured information may be uniquely identified.

Just as instances of information must be uniquely identified, so must their associations.

3.2.1.2.3 Capture

3.2.1.2.3.1 Instances of captured information must be associated, and the associations must be brought within the Phenom system boundary.

Capturing tacit knowledge will require the recording of a sequence of instances of captured information. There is no requirement that the instances be unique. Nor is there any implied dependency, outside of those defined by the association.

It will be necessary to define zero or more elements of an instance of information whose values must be persisted and associated with one of the steps in the recorded process.

Inversely, it will be necessary to define zero or more elements of an instance of information whose value must be derived from a previously persisted value. Obviously, the definition of these elements must be unique within a captured process.

3.2.1.2.4 Submission

3.2.1.2.4.1 Same requirements as information capture.

3.2.1.2.5 Review Process

3.2.1.2.5.1 Same requirements as information capture.

3.2.1.2.6 Community

3.2.1.2.6.1 Same requirements as information capture.

3.2.1.2.7 Branding

3.2.1.2.7.1 Same requirements as information capture.

3.2.1.2.8 Scalability and Reliability

3.2.1.2.8.1 Same requirements as information capture.

3.2.1.3 Annotation

Identifier	
Description	Users must be able to create, save and edit annotations and link them to instances of information (i.e. text, graphics, equations, etc.) while using the product. Depending on ownership, annotations will be accessible via the original author, other members of the author's community, or by the core Phenom community.
Rationale	This will be an early version of a true knowledge capture process.

3.2.1.3.1 Create

3.2.1.3.1.1 Any user may create and attach annotations to any instance of information (e.g. text, files, graphics etc.). However, the creation request must pass through a review process before being published.

3.2.1.3.2 Modify

3.2.1.3.2.1 Any user may modify any existing annotation (must pass through review process before being published).

3.2.1.3.3 Submit

3.2.1.3.3.1 All annotations will be routed through an "editorial" process.
As with all "published" information, it will be necessary to provide a mechanism for reviewing submissions. This process will be necessary for both user submissions to a community within their own organization, or to the Phenom community at large.

3.2.1.3.4 Review

3.2.1.3.4.1 If an annotation is to be made available to all other members of the author's community, or to the members of the core Phenom community, then the author must submit newly created or modified annotations to an editorial review process.
This is important to ensure the validity and suitability of data and to discourage users from submitting unwanted information.

3.2.2 Codify

Identifier	
Description	Must be able to codify captured information and tacit knowledge.
Rationale	Captured knowledge in the form of information and processes cannot be leveraged without the ability to efficiently and effectively locate and use relevant information in a timely manner.

3.2.2.1.1 Taxonomy

3.2.2.1.1.1 Keyword
Implements a unique identifier.
Used to identify unique instances of captured knowledge (i.e. captured information and tacit knowledge).
Used to identify unique instances of categories.

3.2.2.1.1.2 Category
Identified by a single keyword.
Keyword is not unique to an instance of a category.

3.2.2.1.1.3 Target
Defines a coherent set of captured knowledge (i.e. captured information or tacit knowledge) via a set of keyword identifiers.
Set of identifying keywords is not unique to an instance of a target.
Captured information can be of many types (i.e. XML, text, equation, database entry, etc.).
Contains all information required to locate and access the associated captured knowledge (i.e. URL, key index into a database, usernames and passwords, etc.).
Derives context via its association with one or more links.
May contain other targets.

3.2.2.1.1.4 Link
Identified by a keyword.

Associates categories to categories, and categories to targets.
Implements a hierarchy of parent/child relationships between associated endpoints.

3.2.2.1.1.5 Search

Search will be against keyword domain.
For each target whose set of keywords contains the search keyword, all chains of links and categories will be traversed in order to reach one or more category endpoints.
Category endpoints will implement virtual roots of a dynamically generated hierarchy of categories.
Navigation of the category chains will implement a hierarchical search method.

3.2.2.1.1.6 Network model of relationships

Not a tree – therefore, no single unique root.
Categories and targets may be associated with one or more other instances of categories or targets.
No circular references are allowed (links imply a limitation on the traversing of network paths based on a parent/child relationship).

3.2.2.1.1.7 Create

It will be necessary to provide a means to define and create taxonomy. In particular, the creation of categories and links will implement the taxonomy.

3.2.2.1.2 Navigate

3.2.2.1.2.1 It will be necessary to navigate captured knowledge (i.e. information and processes) for the purpose of assigning them to taxonomy.

3.2.2.1.3 Identify

3.2.2.1.3.1 It will be necessary to identify instances of captured knowledge via taxonomy.

There must be a means for associating instances of captured knowledge to entries within taxonomy.

3.2.2.1.4 Review Process

3.2.2.1.4.1 It is mandatory that an editorial review and publication process be applied to all potential associations between instances of captured knowledge with taxonomy.

This is critical to ensure that the overall quality and fidelity of the knowledge base remains high.

3.2.3 Leverage

3.2.3.1 Search – Without Taxonomy

Identifier	
Description	Must allow users to search for keywords, sentences, acronyms and their related meanings, definitions and terms. This applies to all searchable information.
Rationale	This is important for general searches, including material from manufacturers, vendors, etc.

3.2.3.1.1 Semantic

3.2.3.1.1.1 Must be able to respond to natural language queries.

Must be able to structure a query in natural language.

3.2.3.1.1.2 Must be able to understand relationships between different words.
Must be able to understand semantics of query.

3.2.3.1.2 Part

3.2.3.1.2.1 Results of search must be context sensitive.
Must be able to provide results that are relevant only to the part or assembly being designed.

3.2.3.1.2.2 Vendor search results must be able to be grouped according to pre-defined categories.
Search results will depend on user selected grouping criteria, and formatted accordingly.

3.2.3.1.2.3 Search will provide results for parts that match only a predetermined percentage of features specified.
User will define minimum of required features (or a percentage of total features).

3.2.3.1.3 Keyword

3.2.3.1.3.1 Allows keyword search of content.

3.2.3.1.4 Vendor

3.2.3.1.4.1 Allows name, location, and industry search for vendors.

3.2.3.1.5 Journal

3.2.3.1.5.1 Allows keyword search of contents of Online Journal.

3.2.3.1.6 Data

3.2.3.1.6.1 Allows search through charts, graphs, figures, equations and tables.

3.2.3.2 Search – Within Taxonomy

Identifier	
Description	Must allow users to search knowledge base via taxonomy.
Rationale	This is the most powerful method of leveraging captured knowledge.

3.2.3.2.1 Navigate

3.2.3.2.1.1 Must be able to navigate to instances of captured knowledge.
See Codify section above for a description of search.

3.2.3.2.2 Render

3.2.3.2.2.1 Target containers of information must be rendered according to an associated format.
At the time of capture, an "expert template" will, among other functions (such as data validation, etc.) establish a "style" by which the captured information will be rendered (captured information may contain additional captured information).

3.2.3.3 Annotation

Identifier	
Description	Must be able to view and maintain annotations to captured knowledge.
Rationale	Annotations are an established method of insuring the completeness, freshness, and accuracy of captured knowledge.

3.2.3.3.1 Navigate

3.2.3.3.1.1 It will be necessary to provide a means by which a user may navigate annotations to an instance of captured knowledge.

3.2.3.3.2 Maintain

3.2.3.3.2.1 Maintenance will be via capture functionality.

3.2.3.4 Expert Guidance System

Identifier	
Description	Based on the "animation" of captured tacit knowledge, the Expert Guidance System must guide and assist engineers through problem solving activities.
Rationale	This system is what will distinguish Phenom from simply placing a book online and conducting a keyword search. Proper implementation of the Guidance System will lead to more efficient use of time, in combination with reduced errors.

3.2.3.4.1 Usability

3.2.3.4.1.1 Engineers of all skill levels must be able to interact with the Guidance System in order to arrive at the answer they seek.
It's critical that the Phenom system gather as much information as possible, in an efficient manner, such that the best solution may be found with the minimum investment of time and effort.

3.2.3.4.2 Guidance

3.2.3.4.2.1 Engineers must be able to find the best solution to their problem.
It will be necessary to always lead an engineer to a solution.

3.2.3.4.3 Wizard

3.2.3.4.3.1 The Guidance System must be able to suggest alternatives and possibilities that engineers might have overlooked in solving a specific design problem.
This functionality serves the purpose of an interactive expert review of their design solution.

3.3 Content Requirements

3.3.1 Industry Standard Content

3.3.1.1 Information

Identifier	
Description	Must capture most widely used engineering information (i.e. that information which is currently available in popular engineering handbooks, such as the Machinery's Handbook).
Rationale	Phenom will apply the 80-20 rule providing 20% of the information (available in popular handbooks) used by 80% of the engineers

3.3.1.1.1 Limited in Scope

3.3.1.1.1.1 Interneer will provide information contained in popular engineering handbooks, which represents the most widely used information by engineers.
Interneer will not attempt to capture all of the engineering knowledge in the world.

3.3.1.1.2 Variety of Content

3.3.1.1.2.1 Interneer will provide a variety of types of information in a variety of electronic forms, catering to a variety of customer demographics (e.g. tutorials on engineering, tools for brainstorming, tools for mechanism designs, multiple engineering examples, etc.).
These various resources will provide multiple benefits for users.

3.3.1.2 Tacit Knowledge

Identifier	
Description	Must capture industry standard tacit knowledge.
Rationale	Leverage prior work of industry experts.

3.3.1.2.1 Specific Solutions to Broad Set of Problems

3.3.1.2.1.1 Although individual guidance system solutions will be problem specific, the scope of solutions will span a large set of common engineering problems.
Phenom will apply the 80-20 rule for content to ensure that 80% of client engineers are served by 20% of the engineering problems and solutions.

3.3.1.2.2 Engineering Guidelines

3.3.1.2.2.1 The guidance system must be able to solve established engineering problems using established engineering guidelines gathered from books and experts.
Phenom will ensure that guidelines gathered from experts and books will be of value to engineers.

3.4 Functional Requirements – Collaboration and Project Management

3.4.1 Collaborative

Identifier	
Description	Must allow collaboration and exchange of information and work.
Rationale	In order to ensure the most efficient work and design environment, collaboration and information exchange is necessary.
Type	Mandatory

3.4.1.1 Persistent Context

3.4.1.1.1 Engineers need to be able to start collaboration, stop at any time and for as long as needed and then pick up where they left off without any loss of information.
This is important to ensure efficiency.

3.4.1.2 Real time whiteboard/pegboard

3.4.1.2.1 Engineers have to be able to append documents in a collaboration session and be able to edit, modify, delete, save etc.
This is important for productivity.

3.4.1.3 Chat

3.4.1.3.1 Engineers need the ability to communicate while collaborating.

3.4.1.4 Real time shared application view port

3.4.1.4.1 Multiple engineers need to be able to view the online documents and edit privileges should be available to each engineer at different times pending access privileges.

Engineers will need to share and edit project information regularly.

3.4.1.5 Use multiple collaborative tools

3.4.1.5.1 Engineers will need to run some simple tools regularly when collaborating, e.g. online calculator, calendar, etc.
This will improve productivity.

3.4.1.6 Record Session

3.4.1.6.1 A detailed log of all the events, content, participants, times, logoff and logon times and others are essential to ensure proper documentation and knowledge management. Engineers often refer to previous meeting notes.

3.4.1.7 Among Engineers

3.4.1.7.1 Engineers need the ability to share project data and information in real time. The data is in the form of Interneer pages being viewed, files stored, journal entries, and expertise built.
Engineers will need to share project information regularly.

3.4.1.8 Between Engineers and Vendors

3.4.1.8.1 Engineers need the ability to share project data and information in real time with Vendors to ensure proper design. The data is in the form of Interneer pages being viewed, files stored, journal entries, and expertise built.
Engineers will need to tap into vendor expertise regularly.

3.4.1.9 Between Engineers and their Customers

3.4.1.9.1 Engineers need the ability to share project data and information in real time with their Customers. The data is in the form of Interneer pages being viewed, files stored, journal entries, and expertise built.
Engineers will need to obtain Customer approval regularly.

3.4.2 Project Planning/Tracking/Oversight

Identifier	
Description	Must provide simple project planning, tracking and oversight functionalities
Rationale	Engineers will use Interneer to work collaboratively on projects

3.4.2.1 Milestones creation/modification

3.4.2.1.1 Engineers must be able to create simple tasks along with completion dates requirements.

3.4.2.2 Milestones tracking

3.4.2.2.1 Engineers must be able to review project progress and track completed tasks.

3.4.3 Document Management

Identifier	
Description	Must provide means for administering files, user and document control.
Rationale	This is important for collaborative work on projects

3.4.3.1 Approval mechanism

3.4.3.1.1 Ability to install final approval mechanism on document control is necessary.
These are tools that empower the owner of the files

3.4.3.2 Control/track modifications

3.4.3.2.1 Need to track versions of files and users who modified them.
These are tools that empower the owner of the files

3.4.3.3 Control/track user access to files/folders/journal

3.4.3.3.1 Need to track users and their access to files, folders and the journal.
These are tools that empower the owner of the files.

3.4.3.4 Upload/download changes to files only

3.4.3.4.1 System must save bandwidth by only transferring changes to a file.
This is important for cost and efficiency.

3.5 Functional Requirements – General

3.5.1 Analysis

Identifier	
Description	Allows analysis of data, charts and equations in real time.
Rationale	The Phenom work environment must allow analyses in order to provide a complete solution.

3.5.1.1 Solve equations on the site

3.5.1.1.1 Engineers must be able to enter numbers into algebraic equations or figures (if applicable) and solve them online. By solving, it is implied that engineers will obtain a numeric value response or chart in return for entering numeric data into a form.
This is part of a series of tools designed to improve engineers' efficiency.

3.5.1.2 Solve for any variable in equation

3.5.1.2.1 Engineers must be able to leave any variable blank and Phenom must be able to know which one is blank and then solve for it.
This is part of a series of tools designed to improve engineers' efficiency.

3.5.1.3 Chart relationship between two variables in equation

3.5.1.3.1 Engineers must be able to leave any two variables blank and then view a plot that compares their relationship to each other.
This is part of a series of tools designed to improve engineers' efficiency.

3.5.1.4 Chart relationship between three variables in equation

3.5.1.4.1 Engineers must be able to leave any three variables blank and then view a plot that compares their relationship to each other.
This is part of a series of tools designed to improve engineers' efficiency.

3.5.1.5 Interpolate any data point on a table

3.5.1.5.1 Engineers must be able to view the value of any point on a chart.
This is part of a series of tools designed to improve engineers' efficiency.

3.5.1.6 Perform complex equation solving

3.5.1.6.1 Engineers need to be able to solve equations of various complexities, ranging from simple integrals to differential equations and optimization techniques.
This is part of a series of tools designed to improve engineers' efficiency.

3.5.2 Connects with Vendor Database

Identifier	
Description	Must allow Interneer users to search Vendor databases of parts
Rationale	This is critical to achieve a complete, end-to-end solution for engineers.

3.5.3 ASP

Identifier	
Description	Must provide application service provision in the form of CAD, CAM and FEA.
Rationale	The Interneer work environment must allow the ability to run CAD, CAM and FEA in order to provide a complete solution.

3.5.3.1 CAD

3.5.3.1.1 User must be able to store CAD application data on Interneer server account.
This allows users to access and exchange files easily.

3.5.3.1.2 Users can upload/download CAD files in appropriate file format to their accounts so they can be opened with CAD software online/offline.
This is needed for flexibility and ease of exchange between desktop and server.

3.5.3.1.3 User must be able to run CAD application on hourly or quarterly basis.
This provides users with flexibility.

3.5.3.1.4 User must be able to run CAD application in browser, OS and platform independent.
This is important for users who do not have CAD licenses.

3.5.3.2 CAM

3.5.3.2.1 User must be able to store CAM application files on Interneer server account.
This allows users to access and exchange files easily.

3.5.3.2.2 Users can upload/download CAM files in appropriate file format to their accounts so they can be opened with CAM software online/offline.
This is needed for flexibility and ease of exchange between desktop and server.

3.5.3.2.3 User must be able to run CAM application on hourly or quarterly basis.
This provides users with flexibility.

3.5.3.2.4 User must be able to run CAM application in browser, OS and platform independent.
This is important for users who do not have CAM licenses.

3.5.3.3 FEA

3.5.3.3.1 User must be able to store FEA application files on Interneer server account.
This allows users to access and exchange files easily.

3.5.3.3.2 Users can upload/download FEA files in appropriate file format to their accounts so they can be opened with FEA software online/offline.
This is needed for flexibility and ease of exchange between desktop and server.

3.5.3.3.3 User must be able to run FEA application on hourly or quarterly basis.
This provides users with flexibility.

3.5.3.3.4 User must be able to run FEA application in browser, OS and platform independent.
This is important for users who do not have FEA licenses.

3.5.4 Advertisement

Identifier	
Description	Must provide advertisement space.
Rationale	Not only is advertisement a source of revenue, it is also a means to allow our users to continuously be in touch with the latest technology, products and news relating to their industry

3.5.4.1 Ad banners

3.5.4.1.1 Must allow banners on various pages on site.

3.5.4.1.2 Banners must be customized to relate to users expertise and selected criteria.
This is important so that the user only gets targeted and useful ads.

3.5.4.2 News

3.5.4.2.1 Must provide users with the latest news on their respective industry.

3.5.5 Design Guideline Interactive Advisor

Identifier	
Description	Design guideline tool that advises on whether design is valid.
Rationale	Good feature to aide engineers in designing

3.5.5.1 Inspects engineer's work

3.5.5.1.1 Checks to ensure critical errors are not occurring while engineer is designing.
This allows engineers to work with the guidance of the built-in expertise.

3.5.5.2 Optional Feature

3.5.5.2.1 Feature can be disabled by user.

3.5.6 Results Inquiry

Identifier	
Description	Must provide means by which results of an Interneer search be viewed.
Rationale	Provides the means by which the end product of Interneer services may be disseminated.

3.5.6.1 Adjustable results format page

3.5.6.1.1 Engineers can choose the format of the results screen displayed.
User control and flexibility are key elements of the Interneer product.

3.5.6.1.2 Engineers can choose the number of results screen displayed.
User control and flexibility are key elements of the Interneer product.

3.5.6.1.3 Engineers can choose the type of results screen displayed, manufacturing, approved, general, parts

User control and flexibility are key elements of the Interneer product.

3.5.7 Online Journal

Identifier	
Description	Journal saves references of users work on Interneer.
Rationale	This is critical to save engineers time so they do not have to repeat searches.

3.5.7.1 Automatic Storage

3.5.7.1.1 Data is stored automatically on user accounts unless specified otherwise by user and up to the limit of their account storage capacity.

3.5.7.2 Journal Data Encrypted

3.5.7.2.1 Interneer must save data on server in a manner that only the Interneer platform can interpret.
The rational for this is to ensure that users cannot transfer their data to competition making Interneer stickier.

3.5.7.2.2 User can download the journal data for package cost.

3.5.7.3 Journal is Searchable

3.5.7.3.1 User can conduct keyword search through journal.
Ability to search previous user work is very valuable.

3.5.7.3.2 Journal content is linked to expert system.
Expert system needs to be comprehensive and flexible.

3.5.8 Subject to Access Control

Identifier	
Description	All functional categories will be subject to access control
Rationale	Access control needs to be available for all functions

3.6 Performance Requirements

3.6.1 Search Results

Identifier	
Description	Results of keyword search must appear in 5 seconds or less.
Rationale	Users are using Interneer to save time and be more efficient, thus results screens should appear fast.

3.7 Design Constraints

3.7.1 Platform Independent

Identifier	
Description	Interneer must be able to run through any Explorer and Netscape independent of platform.
Rationale	This is important to attract the largest market share.

3.7.2 Auditable Database

Identifier	
Description	Ability to audit activity in database (e.g. track inserts, deletes, adds etc.).
Rationale	This is important for accountability

3.7.3 Windows® Standard User Interface

Identifier	
Description	User interface should conform to "The Windows Interface Guidelines for Software Design" (located on the MSDN Library). Interneer must be immediately familiar to the end user.
Rationale	Following the guidelines laid out by Microsoft will ensure a shorter learning curve for the end user.

In particular, the following features are highly desirable:

1. Hover notes.
2. Right mouse click provides context sensitive options.
3. Must give user the option to navigate through data entry screens without using the mouse, whenever possible, to increase user productivity.

3.8 Operational Constraints

3.8.1 Facilities

3.8.2 Installation

3.8.3 Training

3.8.4 Personnel

3.8.5 Logistics

3.9 Security

Identifier	
Description	Access rights and permissions should be user-based. Access control of all system functionality, audit log, support encrypted data
Rationale	Interneer must project a robust and secure environment.
Criticality	
Source Document	
Verification Method	Analysis
Responsible Person	Romeo Elias
Type	

3.10 Non-Functional Requirements

3.10.1 Producible

3.10.1.1 Implementation

3.10.1.1.1 Implementation should minimize dependencies on specific tools.
(i.e. implementation architecture should be neutral with regard to development tools in order to facilitate future staffing requirements, migrations to new technologies, etc.).

3.10.1.1.2 Implementation should minimize dependencies on arcane developer skills.
(e.g. development should avoid methodologies that rely on arcane skills that may prove to be difficult or prohibitively expensive to acquire when needed).

3.10.2 Testability

Identifier	
Description	System must be defined to a degree that will allow testing that is sufficient to establish conformance with requirements. In addition, the system must be implemented in a fashion that will increase the effectiveness of QA to the highest degree possible.

3.10.2.1 Implementation

3.10.2.1.1 Product should be implemented in such a way as to allow unit testing.

3.10.2.1.2 Modules should be of sufficient granularity as to insure reliability of QA process.
(e.g. the difficulty of defining meaningful test scenarios increases exponentially with the number of functions and/or complexity of a module - inversely decreasing reliability of QA process).

3.10.3 Maintainability

Identifier	
Description	Maintenance of system must be simple, straightforward, and with a minimum of risk.
Rationale	If the system cannot be easily and reliably maintained, the product will not be supportable.

3.10.3.1 Implementation

3.10.3.1.1 System should be modular.
A component model will facilitate isolation and correction of implementation and/or design flaws. In addition, a component model will maximize reuse of development resources.

3.10.3.1.2 Module interfaces must be implemented in such a way as to maximize their longevity.
The amount of development resources required to modify a component interface increases exponentially with the number of components that use those interfaces.

3.10.4 Operability

Identifier	
Description	Must be usable by individuals with minimal or no training.
Rationale	Product must have very low learning curve in order to achieve large market adoption.

3.10.5 Availability

Identifier	
Description	7 x 24 on the Internet

3.10.6 Reliability

Identifier	
Description	System must be reliable
Rationale	Interneer users will want to access their accounts at any time.

3.10.6.1 Implementation

3.10.6.1.1 Product must have thorough and robust exception handling characteristics.
All modules comprising product must be able to detect and properly handle all exceptions, retry recoverable exceptions, etc. without disturbing other processes or shutting down the entire product.

3.10.6.1.2 Product must implement persistent exception handling.
(e.g. error logs).

3.11 Graphical Requirements

3.11.1 Ergonomic Standards

Identifier	
Description	Interneer must follow ergonomic guidelines.
Rationale	This is important since the user will be accessing the site regularly and heavily.

3.11.1.1 Mild Colors

3.11.1.1.1 The selection of colors is critical in ergonomic consideration of the site.
Interneer must be easy to view.

3.11.1.2 Simple Interface

3.11.1.2.1 Non-confusing interface will be ergonomically better.
The simpler the interface, the easier to use and the more intuitive it is.

3.11.2 Matches Company Brand Image

Identifier	
Description	Website image and company brand image must be consistent.
Rationale	This is critical to ensure consistency and branding on all fronts.

4 Appendix

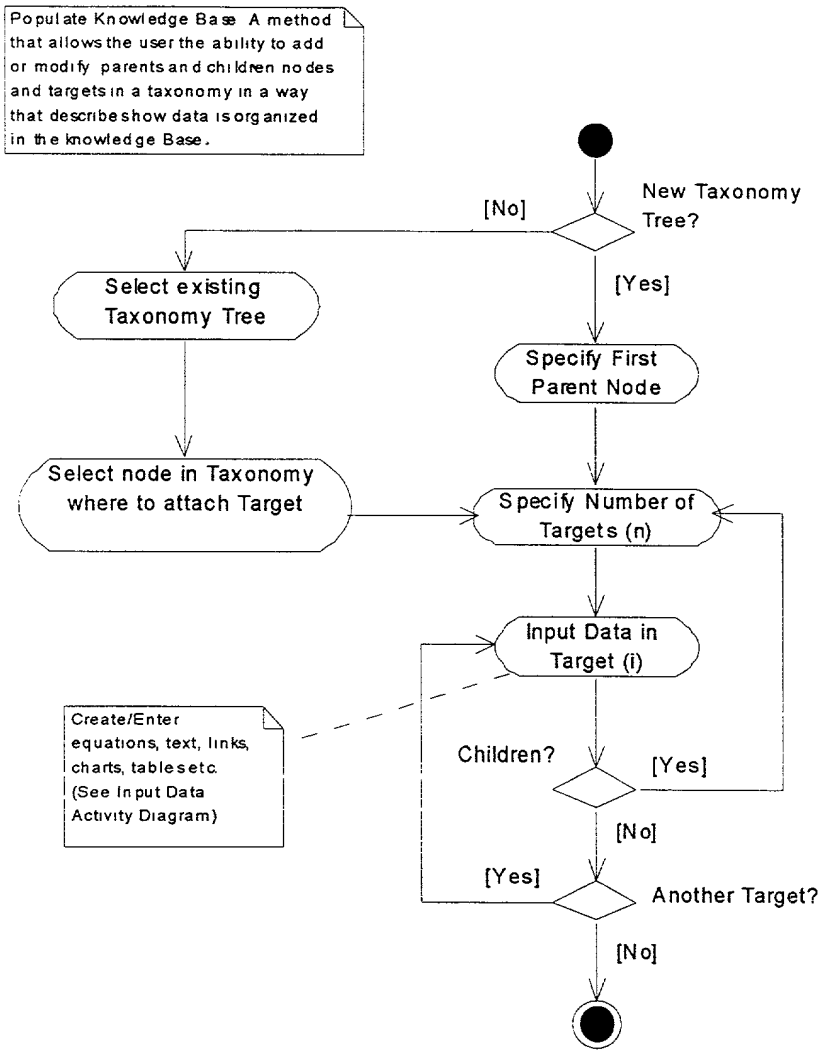
4.1 Activity Diagrams

4.1.1 Embedded Knowledge Management

4.1.1.1 Populate Knowledge Base

A method that allows the user the ability to add or modify parents and children nodes

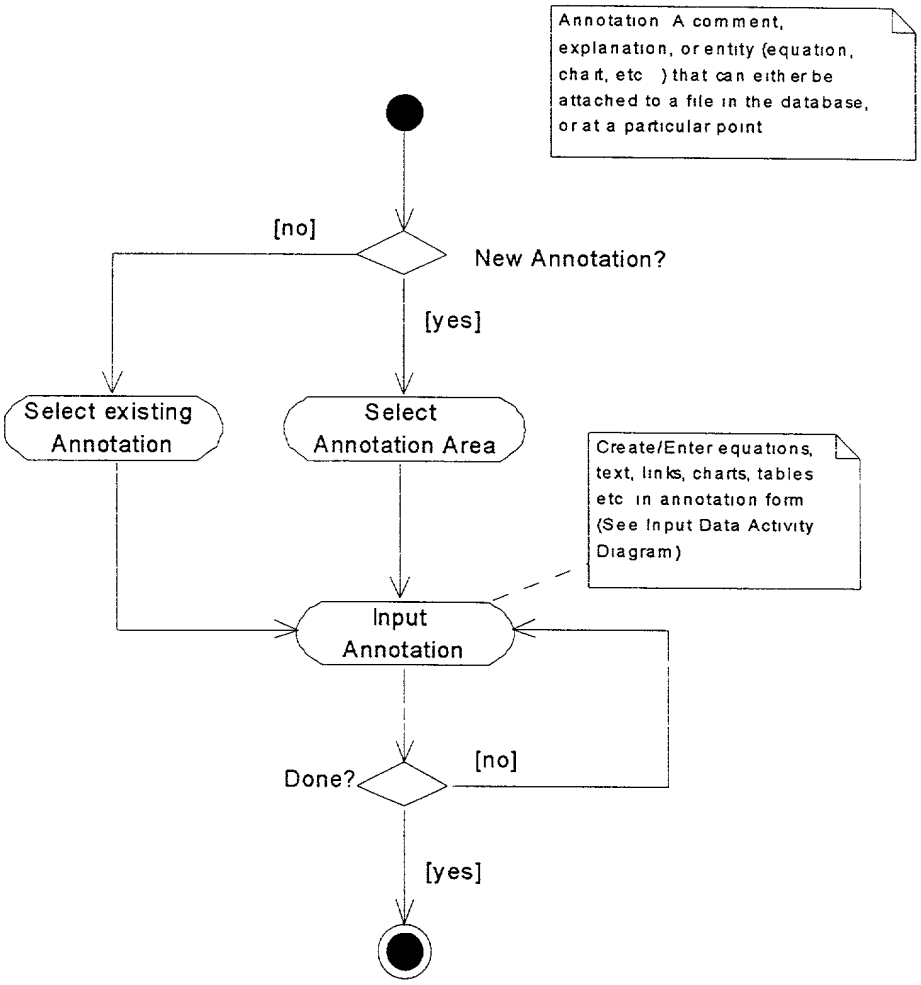
and targets in a taxonomy in a way that describes how data is organized in the knowledge Base.



4.1.2 Embodied Knowledge Management - Annotation

4.1.2.1 Annotate

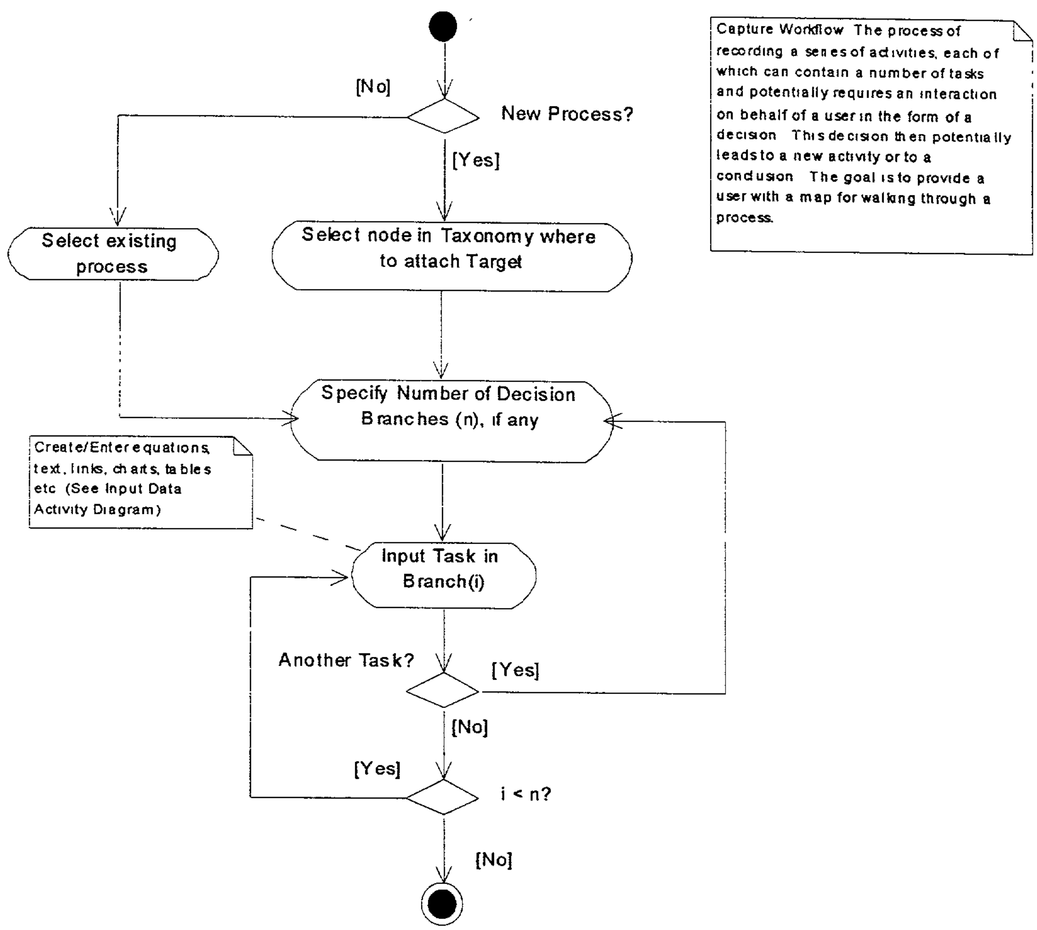
A comment, explanation, or entity (equation, chart, etc.) that can either be attached to a file in the database, or at a particular point.



4.1.3 Workflow Management

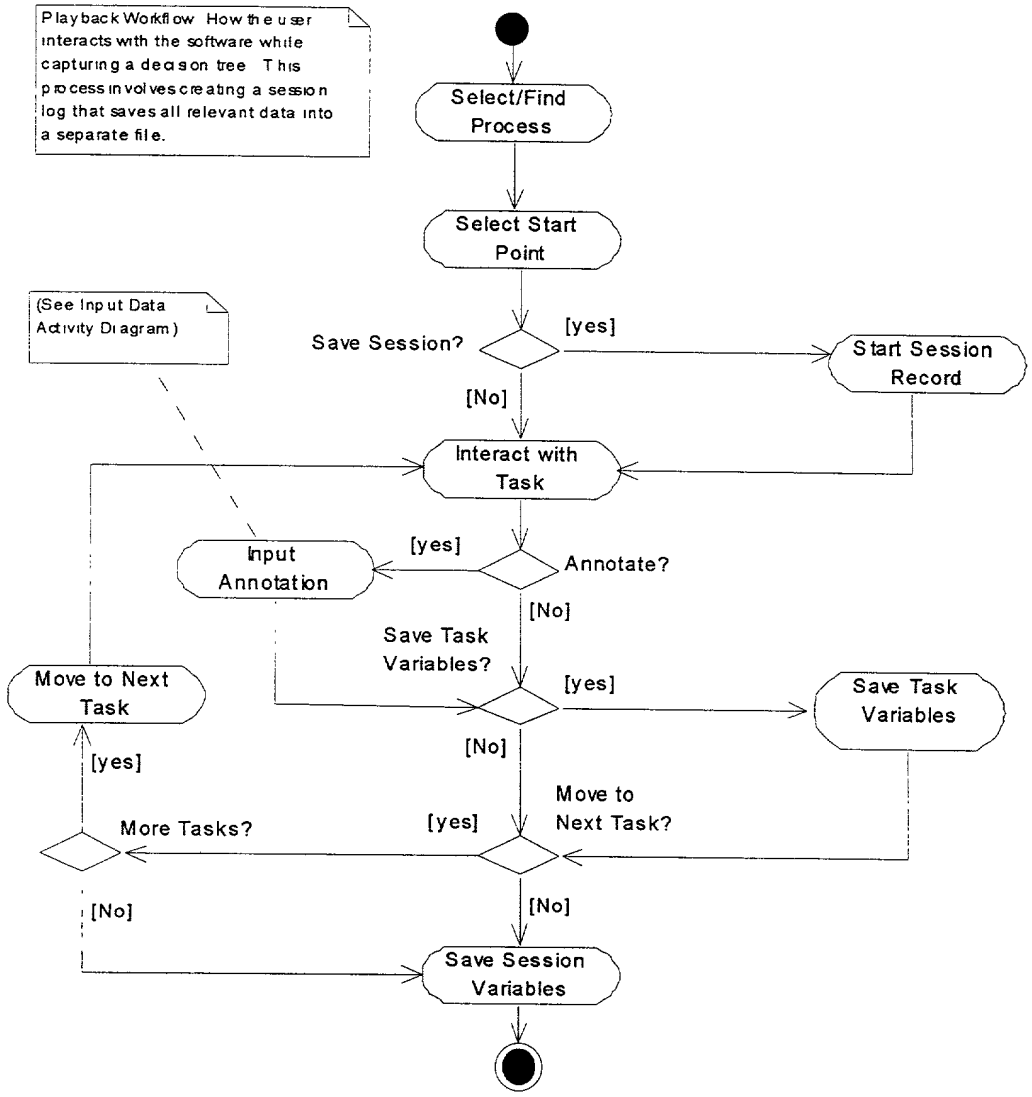
4.1.3.1 Capture

The process of recording a series of activities, each of which can contain a number of tasks and potentially requires an interaction on behalf of a user in the form of a decision. This decision then potentially leads to a new activity or to a conclusion. The goal is to provide a user with a map for walking through a process.



4.1.3.2 Playback

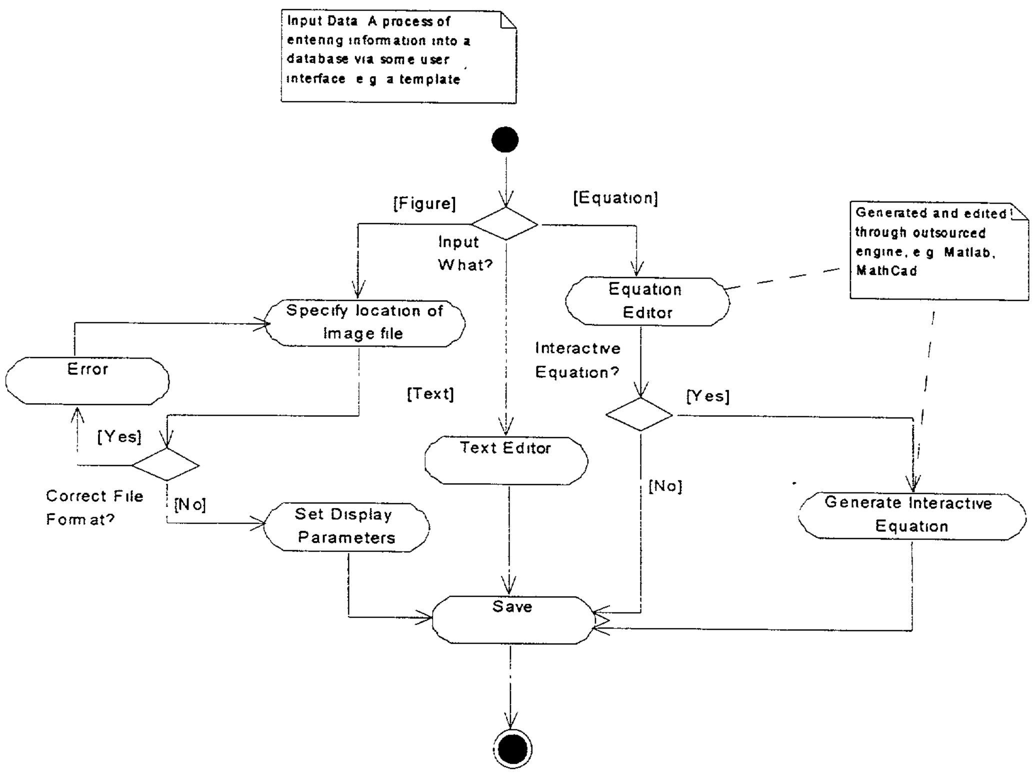
How the user interacts with the software while capturing a decision tree. This process involves creating a session log that saves all relevant data into a separate file.



4.1.4 General Activity Diagrams

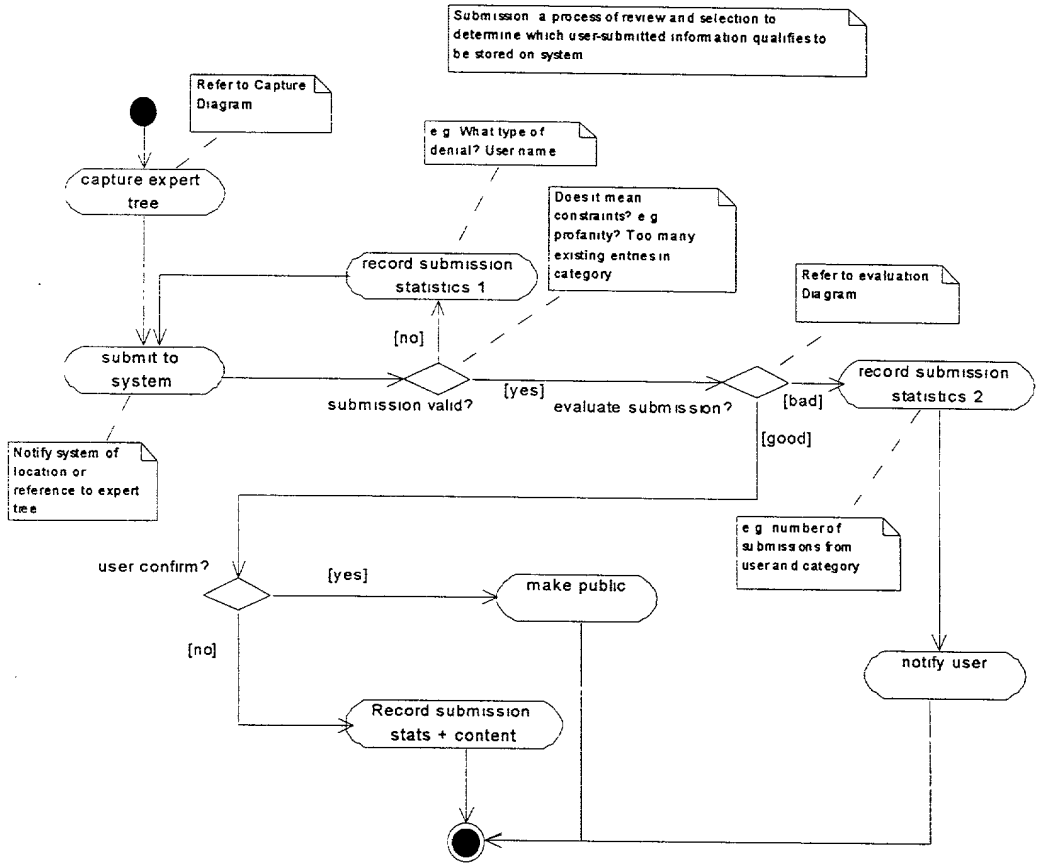
4.1.4.1 Capture

A process of entering information into a database via some user interface: e.g. a template



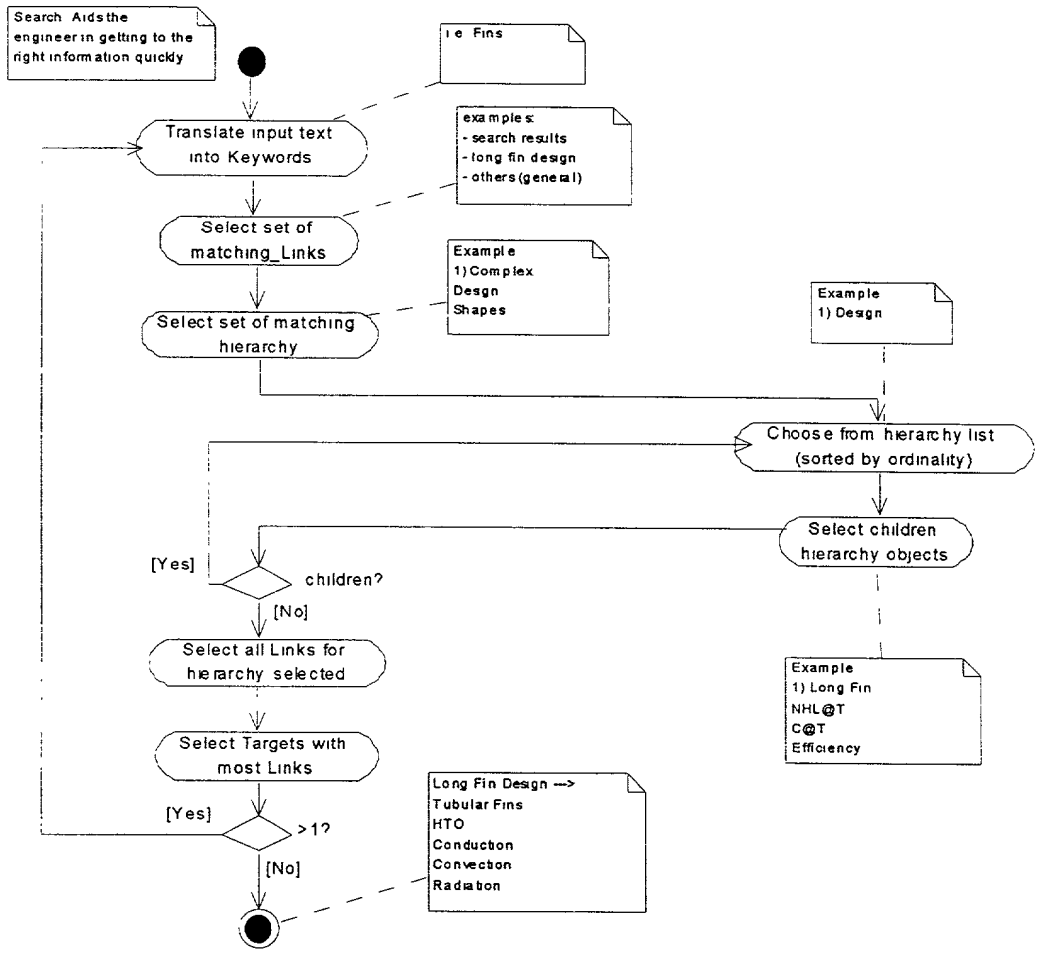
4.1.4.2 Submit

A process of review and selection to determine which user-submitted information qualifies to be stored on system



4.1.4.3 Search

Aids the engineer in getting to the right information quickly



4.2 Glossary

Word	Definition	Activity Diagram
Access	A means of entering and making use of the database	Capture Decision Tree
Activity	A specific set of instructions and guidelines provided to a user within a process	Capture Decision Tree
Advise	To provide information to a user for the purpose of guiding them in completing a task	Capture Decision Tree
Annotation	A comment, explanation, or entity (equation, chart, etc.) that can either be attached to a file in the database, or at a particular point	Annotation
Annotation	Refers to a particular point within a file where the user would like to attach an annotation. This point may be any of an equation, chart, text, or figure areas. The annotation area can also refer to an entire	Annotation
Attach	To connect one file to another	Capture Decision Tree
Branch	A specific path within a division of choices a user must make at a given juncture	Capture Decision Tree
Capture Workflow	contain a number of tasks and potentially requires an interaction on behalf of a user in the form of a decision. This decision then potentially leads to a new activity or to a conclusion. The goal is to provide a user with a map for walking through a process.	Capture Decision Tree

Child	A node or target in a Taxonomy that has an associated Parent node	Capture Decision Tree
Conduct	To direct or control the paths taken within a process	Decision Tree Process
Playback Workflow	How the user interacts with the software while capturing a decision tree. This process involves creating a session log that saves all relevant data into a separate file.	Decision Tree Process
Display Parameters	A set of independent variables that define the size, positioning, and format of some entity	Input Data
Edit	To modify or adapt so as to make suitable or acceptable	Input Data
Editor	A program used to edit text or data files	Input Data
Engineering Process	A process consisting of the application of scientific and mathematical principles to practical ends such as the design, manufacture, and operation of efficient and economical structures, machines, processes.	Capture Decision Tree
Equation	A mathematical statement asserting the equality of two expressions	Input Data
Error	A wrong action on behalf of the user, which results in a message informing the user of their mistake and potential courses of action.	Input Data

Existing Process	A file, already created and stored in the database, which contains a series of actions, changes, or functions bringing about a result	Capture Decision Tree
Figure	Some predefined object, which could be a diagram, chart, graph, equation, photo or picture, which is stored and displayed individually	Input Data
Figure Area	Space within a file or on a web page that is occupied by or reserved for a figure	Annotation
Find	To obtain or acquire through a search	Decision Tree Process
Form	A document or file having a preset format, used to enter information to be submitted to modify or create another document or file	Annotation
Generate	To produce something (equation, chart, etc.) by instructing a computer to follow given parameters	Input Data
Generate	To produce (an interactive equation) by instructing a computer to follow given parameters with a skeleton program	Input Data
Hierarchical	Classified according to various criteria into successive levels or layers	Capture Decision Tree
Image File	A file containing a figure	Input Data
Information	Knowledge communicated by users in the form of text, equations, charts, graphs, etc…	Input Data

Input Data	A process of entering information into a database via some user interface: e.g. a template	Input Data
Interact	Ability for users to enter information and for the software to respond based on information entered	Decision Tree Process
Interactive	Implies that an entity can be made to accept input values, process those values (perhaps in the form of a numeric computation), and then create an output so that the display of the entity reflects the new	Input Data
Knowledge Base	The part of an expert system that contains the facts and rules needed to solve problems in engineering	Annotation
Move	To advance to a next step within a particular activity, or from one activity to another within a process	Decision Tree Process
Node	A connecting point within a Taxonomy at which several lines (links) come together -- some lines (links) going to Children, and some coming from Parents	Capture Decision Tree
Parent	A node in a Taxonomy that has a one or more children -- these Children can be nodes or targets	Capture Decision Tree
Process	A series of actions, changes, or functions bringing about a result	Capture Decision Tree
Record	An account, as of information or facts, set down especially in writing as a means of preserving knowledge	Decision Tree Process

Record / Save	To enter and update information within a file, or to create a new file	Decision Tree Process
Respond	To make a reply to a user in the form of an updated web page or file	Input Data
Select	To take as a choice among several	Annotation
Session	The time during which specific activities or processes take place	Decision Tree Process
Specify	To choose explicitly from several options	Taxonomy Tree Input
Start Point	User specified point within a process where they would like to begin a session	Decision Tree Process
Target	An endpoint in a Taxonomy that is either a file or a process. These endpoints are linked to (potentially) multiple parents, but do not have any children associated with them. They can however contain hyperlinks to different areas within the database.	Capture Decision Tree
Task	A function to be performed with some objective in mind. This may entail interacting with an equation to produce a needed numeric value.	Capture Decision Tree
Taxonomy	A division of files into ordered groups or categories -- defines how data is stored and accessed in the database	Capture Decision Tree

Template	A document or file having a preset format, used as a starting point for a particular application so that the format does not have to be recreated each time it is used	Input Data
Text	A body of printed work submitted by a user	Input Data
User	Any person that interacts with the software. Typically this will be an Engineer or Technician	Taxonomy Tree Input
Variable	A quantity capable of assuming any of a set of values. This quantity can be in the form of a symbol in a mathematical expression.	Decision Tree Process

4.3 Use Case Scenarios

4.3.1 Add Annotation

Version	Date	Comments	Approved	Date
00.00.01	11/17/00			

Summary
Actors: Engineer
Manager
Technician
Vendor
Content Worker
Initiating Actor: Engineer, Technician, Vendor, Content Worker (producer of knowledge)
Benefiting Actor: Engineer, Technician, Manager (consumer of knowledge)
Initial Condition: They are 'parked' on a Target
Terminal Condition: Annotated Target

4.3.1.1 Flow of Events for the Add Annotation Use Case

4.3.1.1.1 Preconditions
The User must have initiated a session in order for this Use Case to begin.

4.3.1.2 Main Flow

4.3.1.2.1 This use case begins when the User identifies an entity that they would like to add an annotation to or modify an existing annotation.

4.3.1.2.2 The User then indicates that they would like to add an annotation, and the system prompts the User to select the desired activity: ADD TEXT, ADD EQUATION, ADD FIGURE, ADD TABLE, ADD CHART, or QUIT.
IF the activity selected is ADD TEXT, Add Text Annotation subflow is performed.
IF the activity selected is ADD EQUATION, Add Equation Annotation subflow is performed.
IF the activity selected is ADD FIGURE, Add Figure Annotation subflow is performed.
IF the activity selected is ADD TABLE, Add Table Annotation subflow is performed.
IF the activity selected is ADD CHART, Add Chart Annotation subflow is performed.
IF the activity selected is QUIT, the use case ends.

4.3.1.3 Subflows

4.3.1.3.1 Add Text Annotation

4.3.1.3.2 The system displays the text screen containing fields for textual input and display parameters.

4.3.1.3.3 The user enters their text and parameters.

4.3.1.3.4 The system displays a draft of the proposed annotation.

4.3.1.3.5 The user then selects from a number of activities: ACCEPT, MODIFY, QUIT.
IF the activity selected is ACCEPT, the new annotation is added to the database, and the use case begins again.
IF the activity selected is MODIFY, the user is taken back to the text screen.
IF the activity selected is QUIT, the use case then begins again.

4.3.1.3.6 Add Equation Annotation

4.3.1.3.7 The system displays the equation screen containing modifiable fields for variables and equation parameters.

4.3.1.3.8 The user selects the number of variables contained in the equation.

4.3.1.3.9 The user then has the option to set limits on the values the variables can take.

4.3.1.3.10 The user names each of the variables and enters a brief description of each.

4.3.1.3.11 The user then selects from a number of activities: INTERACTIVE, STATIC.
IF the activity selected is INTERACTIVE, the system creates input fields and an associated numerical equation.
IF the activity selected is STATIC, the system displays a draft of the proposed annotation.

4.3.1.3.12 Add Figure Annotation

4.3.1.3.13 Add Table Annotation

4.3.1.3.14 Add Chart Annotation

4.3.1.4 Alternative Flows

4.3.2 Input Data

Version	Date	Comments	Approved	Date
00.00.01	11/17/00			

Summary

Actors: knowledge worker
knowledge user
administrator

Initiating Actor: knowledge worker
Benefiting Actor: knowledge user
Initial Condition: User is logged in and in the Phenom environment
Terminal Condition: Data file is created

Flow of Events for the *Input Data* Use Case

4.3.2.1 Preconditions

4.3.2.1.1 The user must have chosen a point in the database where they wish to store the particular piece of information.

4.3.2.1.2 The user must be authorized to add information at the point they have chosen.

4.3.2.1.3 If the user is inputting an equation, it is assumed that it is a dynamic equation. Static equations can be entered as text.

4.3.2.2 Main Flow

4.3.2.2.1 This use case begins when the user identifies a point in the database where they would like to add a piece of information.
The user then indicates that they would like to insert data at that point.

4.3.2.2.2 The system verifies that the user has permission to input data at that point and then prompts the user to select the desired activity: ADD TEXT, ADD EQUATION, ADD FIGURE, or QUIT.
IF the activity selected is ADD TEXT, the S2-1: *Add Text* subflow is performed.
IF the activity selected is ADD EQUATION, the S2-2: *Add Equation* subflow is performed.
IF the activity selected is ADD FIGURE, the S2-3: *Add Figure* subflow is performed.
IF the activity selected is QUIT, the use case ends.

4.3.2.3 Subflows

4.3.2.4 Add Text

4.3.2.4.1 The system displays the text screen containing fields for textual input, type, and location parameters.

4.3.2.4.2 The user enters their text, the type of file they are creating (target, node target), and the specific location or locations within the database that the information will lay.

4.3.2.4.3 The user then selects one of two activities: SUBMIT TEXT or CANCEL
IF the activity selected is SUBMIT TEXT, the S2-4: *Submit Text* subflow is performed.
IF the activity selected is CANCEL, the use case then begins again.

4.3.2.5 Add Equation

4.3.2.5.1 The system displays the equation screen containing modifiable fields for variables, equation parameters, and display parameters.

4.3.2.5.2 The user selects the number of variables contained in the equation.

4.3.2.5.3 The user selects the display parameters and type of data file they are creating (target, node target).

4.3.2.5.4 The user has the option to specify limits the values in the variables can take.

4.3.2.5.5 The user names each variable and enters a brief description of each.

4.3.2.5.6 The user names the equation and the system verifies that the name is not already in use.

4.3.2.5.7 The user then selects a desired activity: SUBMIT EQUATION or CANCEL
IF the activity selected is SUBMIT EQUATION, the S2-5: *Submit Equation* subflow is performed.
IF the activity selected is CANCEL, the use case then begins again.

4.3.2.6 Add Figure

4.3.2.6.1 The system displays the figure screen containing fields for figure location and display parameters.

4.3.2.6.2 The user indicates the type of file to be submitted (chart, table, graph).

4.3.2.6.3 The user can then upload a file or browse the database to select a particular file.

4.3.2.6.4 The user sets the display parameters of the figure within the file the system is creating (size, positioning)

4.3.2.6.5 The user names the figure and the system verifies that the name is not already in use.

4.3.2.6.6 The user then selects a desired activity: SUBMIT FIGURE or CANCEL
IF the activity selected is SUBMIT FIGURE, the S2-6: *Submit Figure* subflow is performed.
IF the activity selected is CANCEL, the use case begins again.

4.3.2.7 Submit Text

4.3.2.7.1 The system displays a draft of the proposed text file.
The user then selects from a number of activities: ACCEPT, MODIFY, or CANCEL.
IF the activity selected is ACCEPT, the system updates the database, notifies anyone on the notification list, and the use case begins again.
IF the activity selected is MODIFY, the user is taken back to the text screen as they left it.
IF the activity selected is CANCEL, the use case begins again.

4.3.2.8 Submit Equation

4.3.2.8.1 The system generates a working numerical version of the equation, verifies that the equation is of valid format (E2-1), and then generates the visual display of the equation along with any areas that require user input.

4.3.2.8.2 The system then displays a working draft of the proposed equation file.

4.3.2.8.3 The user interacts with the file by plugging in numbers and verifying that the generated equation is in fact correct.

4.3.2.8.4 The user then selects from a number of activities: ACCEPT, MODIFY, or CANCEL.
IF the activity selected is ACCEPT, the system updates the database, notifies anyone on the notification list, and the use case begins again.
IF the activity selected is MODIFY, the user is taken back to the equation screen as they left it.
IF the activity selected is CANCEL, the use case begins again.

4.3.2.9 Submit Figure

4.3.2.9.1 The system verifies that the file type is recognizable (E2-2).

4.3.2.9.2 The system displays a draft of the proposed figure.

4.3.2.9.3 The user then selects from a number of activities: ACCEPT, MODIFY, or CANCEL.
IF the activity selected is ACCEPT, the system updates the database, notifies anyone on the notification list, and the use case begins again.
IF the activity selected is MODIFY, the user is taken back to the figure screen as they left it.
IF the activity selected is CANCEL, the use case begins again.

4.3.2.10 Alternative Flows

4.3.2.10.1 An invalid equation is entered. The system prompts the user with an error message pointing them to the problem area and also displays the equation screen so that the user can fix the problem.

4.3.2.10.2 An invalid figure type is submitted. The system prompts the user with an error message indicating that the file type is unknown and also displays the figure screen

so that the user can either enter a new figure or cancel the transaction. The system should also send a message to the administrator indicating a new type of file.

4.3.3 Populate Knowledge Base

Version	Date	Comments	Approved	Date
00.00.01	11/17/00	First Draft Release for review		

Summary

Actors: knowledge worker
knowledge user
Initiating Actor: knowledge worker
Benefiting Actor: knowledge user
Initial Condition:
Terminal Condition:

Flow of Events for the *Populate Knowledge Base* Use Case

4.3.3.1 Preconditions

4.3.3.1.1 The User must have initiated a session in order for this Use Case to begin.

4.3.3.2 Main Flow

4.3.3.3 Subflows

Alternative Flows

4.3.4 Submit and Review

Version	Date	Comments	Approved	Date
00.00.01	11/17/00			

Summary
Actors:
Initiating Actor:
Benefiting Actor:
Initial Condition:
Terminal Condition:

Flow of Events for the *Submit and Review* Use Case

4.3.4.1 Preconditions

4.3.4.1.1 The User must have initiated a session in order for this Use Case to begin.

4.3.4.2 Main Flow

4.3.4.3 Subflows

4.3.4.4 Alternative Flows

4.3.5 Expert Guidance

Version	Date	Comments	Approved	Date
00.00.01	11/17/00			

Summary
Actors:
Initiating Actor:
Benefiting Actor:
Initial Condition:
Terminal Condition:

Flow of Events for the *Expert Guidance* Use Case

4.3.5.1 Preconditions

4.3.5.1.1 The User must have initiated a session in order for this Use Case to begin.

4.3.5.2 Main Flow

4.3.5.3 Subflows

4.3.5.4 Alternative Flows

4.3.6 Approve or Reject Submission

Version	Date	Comments	Approved	Date
00.00.01	11/17/00			

Summary
Actors:
Initiating Actor:
Benefiting Actor:
Initial Condition:
Terminal Condition:

Flow of Events for the *Add Annotation* Use Case

4.3.6.1 Preconditions

4.3.6.1.1 The User must have initiated a session in order for this Use Case to begin.

4.3.6.2 Main Flow

4.3.6.3 Subflows

4.3.6.4 Alternative Flows

4.3.7 Define Workflow

Version	Date	Comments	Approved	Date
00.00.01	11/17/00			

Summary

Actors: knowledge worker
knowledge user

Initiating Actor: knowledge worker
Benefiting Actor: knowledge user
Initial Condition: User is logged in and is in the Phenom environment
Terminal Condition: A workflow is created

Flow of Events for the *Define Workflow* Use Case

4.3.7.1 Preconditions

4.3.7.1.1 The User must have initiated a session in order for this Use Case to begin.

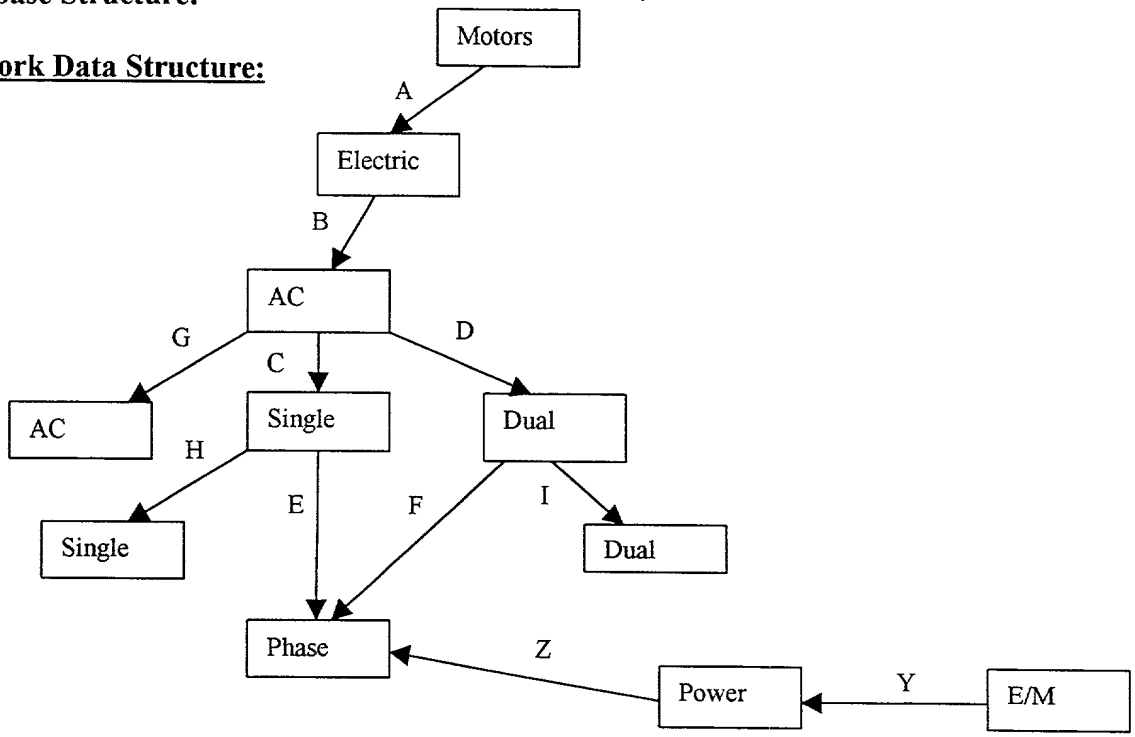
4.3.7.2 Main Flow

4.3.7.3 Subflows

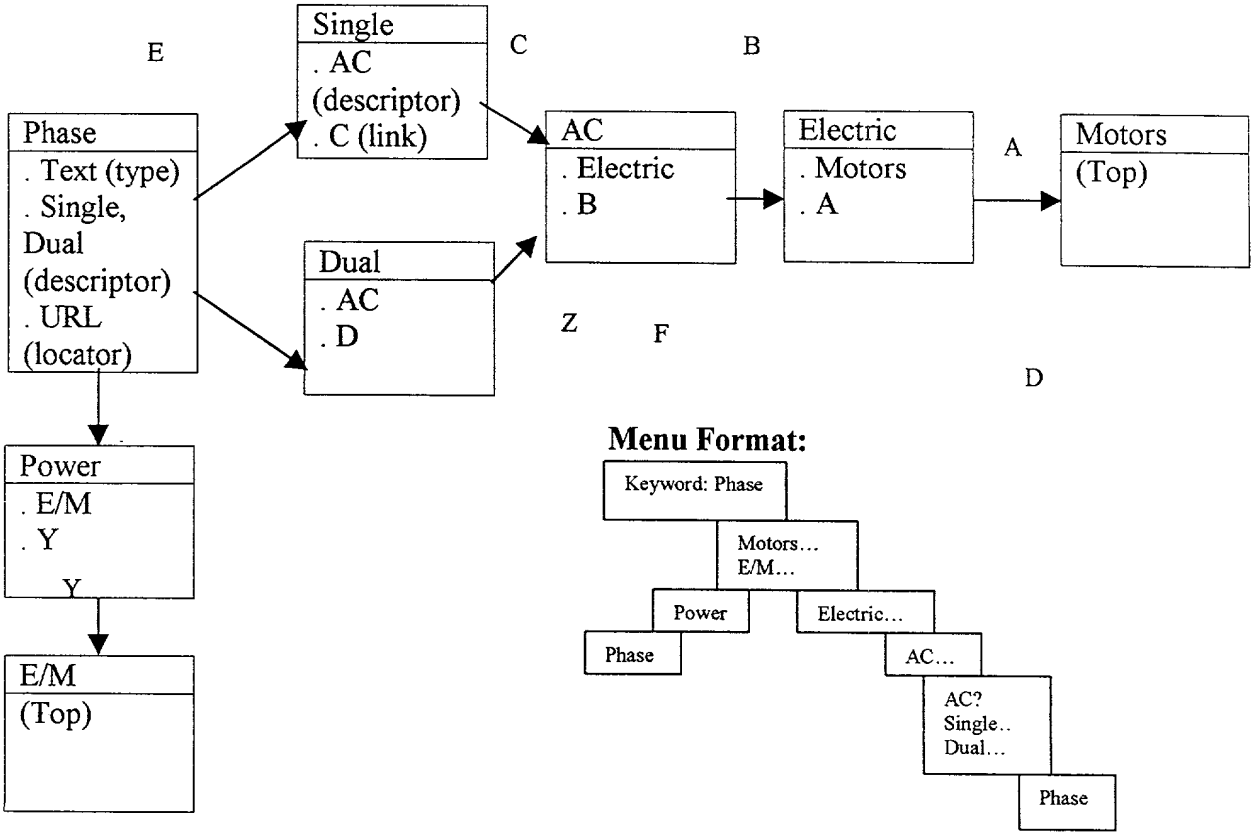
4.3.7.4 Alternative Flows

Database Structure:

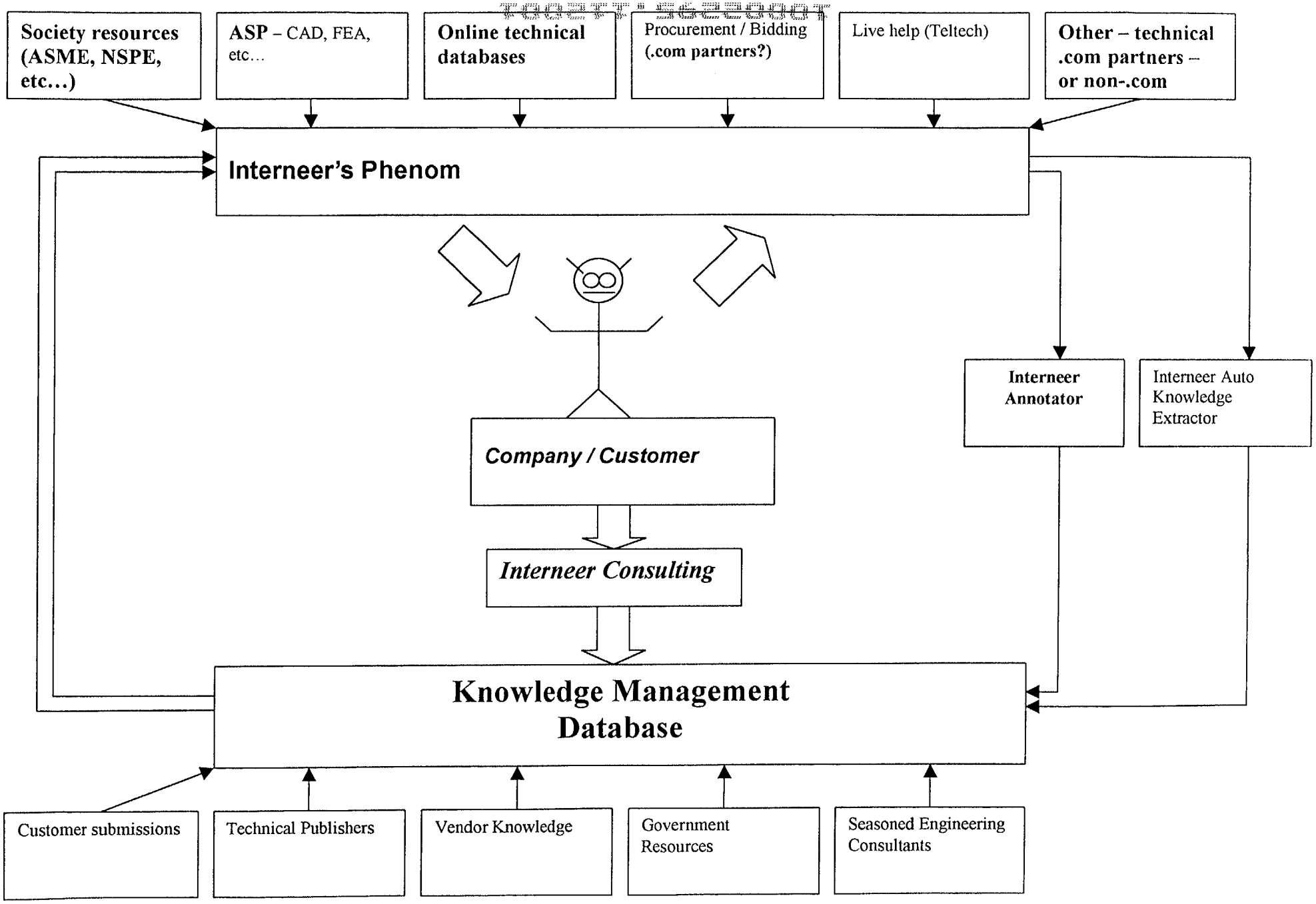
Network Data Structure:



Target, Node and Link Class Relationships:



Menu Format:


Society resources (ASME, NSPE, etc…)
ASP – CAD, FEA, etc…
Online technical databases
Procurement / Bidding (.com partners?)
Live help (Teltech)
Other – technical .com partners – or non-.com
Interneer's Phenom
Company / Customer
Interneer Annotator
Interneer Auto Knowledge Extractor
Interneer Consulting
Knowledge Management Database
Customer submissions
Technical Publishers
Vendor Knowledge
Government Resources
Seasoned Engineering Consultants

The following section provides a brief description of each of the Figures, which portray one preferred embodiment of a network-accessible embodiment of the invention.

Figure 1

Interneer provides a secure account for each user. The user navigates on the Internet (or extranet/intranet, depending on user preference) through a browser. Then they enter their unique username and password and press login. Interneer then checks their username, matches it to their password, and ensures the user isn't already logged into the site.

The user can also be identified with a specific community (e.g. their company). This login page can be customized for different user communities both functionally and graphically (brand etc.). If the user is identified with multiple communities, they can be prompted with a request for choosing their desired destination. The user can also customize their settings to choose the next page after login. They can choose from a number of pages including a search page, a community page, a portal page, or others.

Figures 2 and 3

These figures show the Search and Browse page. In this page, the user has access to all the tools and functionalities they specify when setting up their customized account (default settings are also available). They can review their online journal (activity log) of their previous designs, previous interactions with the software, and purchases; they can choose to view a list of online software that they can deploy online; they can go to the research area where they can browse the latest news and research on engineering, technology, and any other topic they specify; they can access their account information which details their recent purchases and membership information; and finally they can choose to personalize the availability, layout, and operation of specific functions and searches. Additionally, many features will be made available to users in packages. Advertisements can also be placed on the page and can be dynamically generated based on the user's past interaction with the software, their user community, and the request of the advertisers.

Other key areas that can be accessed from this screen are the project management, collaboration and access control tools. Interneer allows users to create folders and store them as well as provide controlled access to them. Users can track project progress, goals and milestones achieved. If they choose to, they can view other users' work and also make theirs available. They can view the work real-time or by simply accessing others folders or emailing the work pages.

The search and browse works in the following manner:

a) Keywords are entered into one of the search boxes. Each of the search boxes is primarily associated with a different database of information that is being searched, however all databases are cross-linked in a neural network of knowledge bundles. If the user wants to

search the same primary keywords in multiple databases, all they need to do is enter them in one and check the other boxes those same keywords need to be searched in. If the user wants to search different primary keywords in different databases, all they need to do is enter different keywords in the different search boxes. This way, for example, a user can search for "motors" under the 'manufacturing' box and "motor design" under the 'problem' box. The result of these searches would be information on motor manufacturers as well as guidelines on motor design.

b) The user then clicks on the downward-pointing triangle to the right of the box they entered keywords in. This triggers the software to conduct the search based on those keywords and return a list of categories that relate to these keywords in a drop down list. So in the specific case of "Heat Sink" being entered in the 'part description' box, a list of categories is returned for the user to browse through. If the user then clicks on a specific category in the list, and the category has sub-categories associated with it, another drop down list is presented – all the while the original list remains open and in its original position. These additional sub-category lists continue to be displayed with each click by the user until there are no more sub-categories. Every category, however, does have an associated end point. Once a user clicks on a sub-category that has no more sub-categories under it, a record of the categories and sub-categories is listed on the page above the box to provide feedback to the user about what selections have been made. Now, if a user is browsing down the categories and sub-categories and realizes they have taken a wrong path, they can then browse to different areas or back up to a point where they feel they want to see all the sub-categories there, not necessarily relating to the keyword initially entered. This allows the user to see a larger picture of how the results are determined and provides more freedom and flexibility for them to change their minds.
c) Step b) is repeated in every box as desired by user.
d) The user presses the GO button, and is then taken to the result page for the specified query. If more than one result exists, the user is shown one expanded result first and a list of links to others. The expanded result is the software's 'best guess' at what the user is looking for and is based on where the information lies in the taxonomy, how often it has been accessed previously (by this or other users), and other weighting factors. Also, the results of the different databases searched will be displayed based on the customization the user implements in the personalization section.

Figure 4

This is an embodiment of a sample results page explaining how to conduct an engineering process (it can also be a process in another field depending on the application of the software). On the left side of the screen we see a number of icons, which will be explained as we describe the different pages. The icons to note here are the 'Be an Expert' icon which allows the user to submit a form which describes their aptitude and experience regarding a certain engineering topic so that Interneer staff members can evaluate them as a potential reference for the specific topic displayed on the page; the 'Help' icon which takes users to an online help on how to use the site and also connects you with experts in the specific area displayed on the page; the 'Software' icon which provides access to the latest engineering software that is accessible

directly on Interneer. This software can be CAD, CAM, CAE, FEA or other software that is useful to the user – the data from the software can be stored in the user's personal accounts; the 'Research' icon which takes users to the latest information on engineering and technology research and news; the 'Personalize' icon which takes users to the personalization screen; the 'Account Info' icon to show users their account status, details and pending purchases or payments; and the 'Journal' icon which takes users to their online activity log.

At the top of the screen, we note that there are two tabs; the 'Search Results' and 'Problem Description' tabs. These tabs are shown minimized, and when maximized, they provide a list of additional results and cross-references to this topic based on your search. The latter describes in detail the problem that is being solved and the background information that is needed to understand it. Page 5 shows these 2 tabs expanded. The reason for the location is to ensure that engineers are not bombarded by information and text as they are when reviewing a handbook. The information is non-intrusively presented providing the user the flexibility to read or not.

Below that, we see a diagram of nodes. The nodes represent the different steps a user would follow in order to complete the process or guideline. So, at the first step, all possible choices lead to three different steps. Depending on which step a user picks, they will be directed to the appropriate one and then to the one after based on the diagram. So in the case on page 4, if the user selects 'computer chips', they will be taken to the 'Computer Chips Fin #' step. If they select 'Motors' or 'Pipes', they will be taken to the 'Motors/Pipes overall' step. And if they select 'Micro Technologies' or 'All other applications', they will be taken to the 'Micros/Other Description' step. Now, the first 2 choices lead to additional steps, but the third stops there. The user can view by looking at this diagram the whole layout of the guideline.

In the middle of the screen are presented the Process Title, Step Title and the descriptions as well as choices the user needs to make in order to move to the next step. Once a choice is made, the user can then hit 'Step 2' to move on to the next appropriate step, based on what the diagram shows.

These pages are highly customizable both functionally and by layout. The idea is to provide the maximum level of convenience and access to users. Each of their interactions is recorded for later perusal. By making all of these resources available in one place, the users are able to save a great deal of time in their work, they are less prone to mistakes, and they are afforded greater freedom in making creative and innovative decisions.

Figures 5 and 12

This figure shows a web page that demonstrates Step 2 of the 'How to Design a Heat Sink' process. In this case we see in the main section of the page an equation with variables that are defined underneath along with field boxes, a figure and an assumptions paragraph.

The equation is interactive in the sense that users can enter data into the fields to the right of the variable descriptions, leave any of the fields blank, hit the 'Solve' icon and The software will

then figure out which variable to solve for (i.e. the blank one) and display a result. A drop down is also seen on the screen for selection of a material, so that when the user selects a material, the property values (e.g. modulus, density etc.) are automatically entered into the appropriate field in the equation variable list – in this case, for "h" and "k". Also, there are drop downs for each variable for possible units to use. These drop downs allow users to specify any applicable unit for any applicable variable and to select an output unit different than the others. So, for example, a user can specify Watts for "Q", and Degrees Fahrenheit for "T0", and inches for perimeter, and request the cross-sectional area to be in millimeters squared.

The figure in the middle of the screen is also interactive. The user can type directly into boxes on the image the values of the equation variables where applicable. Also, the 3D shape of the figure will change dynamically based on the values entered for the variables when applicable (e.g. for perimeter, area etc.). When done iterating the values in the equation and solving the equations, the user can simply click on the image and choose to download it with the appropriate shape and file format (a certain CAD file format for example) to their computers.

The 'Assumptions' section on the screen describes constraints and guidelines on when the equation is usable and other issues the user should look out for (implementation/application issues, etc.). The assumptions screen is also linked to the values entered for the variables and checks to see if a value does not fit the constraint. So for example, there may be an assumption that states that the length cannot be larger than 100cm. So if the user enters 99cm, the software will prompt them and warn them about the violation. The assumptions can tie multiple variables together; such as saying the length must be twice the width. An additional feature determines, on a more macro level, if any constraints are being violated in the interaction of the particular equation with other designs in a project or a collaborative effort. In other words, on page 5 is shown one particular design application, however this design may in fact be one piece of a larger design (in this case perhaps the design of a desktop computer for example).

In addition to solving the equations dynamically online, the user can also choose to conduct design tradeoff analyses by leaving two or three fields empty thus prompting the software to plot the selected variables in 2D or 3D against each other in order to optimize their solutions to the equation and in the design. When the user leaves 2 or 3 variables blank, the software will then prompt them to specify which variable for which axes and what the range to plot is. Then a plot is generated (for example in the place of the figure, depending on specified customization layout) and shown on the same screen as shown on Page 12.

The 'Tables' icon allows the user to look up constants, material properties, empirical data, etc. This data can be presented in the form of tables or charts and the software will allow the user to adjust the axes definitions if it's a chart so that it is reproduced based on the new definition. In other words, the tables and charts can be customized and dynamically generated. With the tables, Interneer allows the user to specify a value in between two adjacent table values and the software provides an interpolated result.

Figures 6 and 7

These figures portray how a user can capture their knowledge. Interneer provides multiple ways of capturing knowledge:

a) The user's work is by default being captured in a history feature, which holds a link to all the work and data they accessed, in all their interactions with the software, as well as entered into the pages for a certain period of time. The history may or may not ultimately expire based on user settings or default software settings. This feature essentially stores a detailed journal of the user's actions and interactions and is one form of knowledge capture. The software can also detect and store users' actions when they leave the Interneer site and interact with other software applications they find useful in their daily activities.
b) The user can also click the 'Save' icon, which creates a bookmark to that specific page along with the data the user entered into that page (e.g. values of equations etc.). By clicking on 'Save', the user is specifying that this specific page is more valuable to them than the others in the history. This bookmarked page may also be found in the history and is displayed to the user in their journal area and represents more valuable knowledge that the user chose to capture.
c) The user can also click the 'Annotate' icon, which, as shown in page 6, shows a list of annotations that were previously created by them, other users, or even Interneer. The list of annotations may always be shown to the user without having the user click the icon. The user can also choose to create, edit, search or delete existing annotations by interfacing with the annotation tool as can be seen on page 7. The annotations also track who entered the annotation, ensuring that no user can assume another's identity and annotations are subject to review and access control. So, once an annotation is submitted, it is automatically approved if it is only for personal use, and is subject to review if it will be accessible to other users in an organization or to the Interneer community of users as a whole.

Figure 8.

Once the user has completed designing on Interneer and has specified the values for the different variables that define the part they are seeking, they can then click on the 'Suppliers' icon which conducts a search into vendor databases of parts and presents a list of suppliers who carry the part in stock. Information on lead-time, availability, cost, and properties of the specific part is presented. The information presented is based on the actual values inputted and the decisions made while the user interacts with the software in a given design process.

The vendors are divided into "approved" and "General", where the former represents suppliers that have been designated as approved by the user or their organization to use for whatever reasons, and the latter represents suppliers that have not been screened by the user or organization. "Approved" can also imply many other things such as that the vendor has been used by Interneer customers and has received favorable reviews. The user can specify the definition in their customized settings.

"Going Orders" are also listed to show who else in the organization is ordering from the suppliers so that the user can choose to consolidate orders and save time and money.

The search also provides a list of suppliers that have parts that are similar to the one predefined by the user but slightly different, so that the user can choose to modify their design if needed to improve cost or lead-time on the part. This feature provides the user with a great deal of information to be used in their design tradeoff analyses. In product design for example, many times engineers are unaware that by making adjustments to their specifications, but still maintaining their design constraints, they can save an enormous amount of money. By clicking on the supplier name, the user is then taken to a page that shows further information on the vendor.

It is also important to note that the user can share the information in this page with colleagues, procurement agents, customers, managers etc. They can do this by collaborating online, viewing the same page in real-time or by emailing the page to the other parties. In this page, the user can also add annotations or view others'.

Figures 9 and 10

These figures demonstrate another example where the user searches under the 'Problem' database for Bearing Life designs. Figure 10 shows another interactive equation as part of a process that the engineer can use with assumptions.

Figure 11

If at any time the user clicks on the 'Capture' icon, they are then taken to the capture template. This is another way for the user to capture knowledge. Specifically, they can capture any process they find useful in their daily work, or that they feel another user (either in their community or the Interneer community at large) would find useful. These processes can range from designing a handheld electronic device to specifying an accounting best practice to a decision tree for cooking pasta. The only limitations are the users' imaginations. Any information intensive industry in particular will find this feature especially useful. The user enters the process title, the step title, description text, inserts a figure if necessary, inserts an equation if applicable, and then specifies conditions as needed. For example, to create a process such as the one starting on page 4, the user does the following:

a) They specify a Process Title as shown.
b) Then they specify a step title.
c) Description of the problem is entered as needed in the Description box.
d) The user can click on 'Browse' to pick an image from their directory and upload it to Interneer.
e) The user can enter an equation in text format into the equation box, and then click 'Insert Equation'. This will then provide the user a list of all the variables in the equations in a form, allow them to specify descriptions for each, and what type of unit family they fall under (e.g. length, energy, force etc.). If there are constraints on the values for each of

the variables or for how two of them interrelate, then the user can specify that. Once the equation variables have been defined, assigned units and constrained as necessary, the user can then save it.

f) The user then saves the whole page by clicking on the 'SAVE' button inside the form. By doing that the first step of the process is dynamically created and stored. Now the user can specify whether there are decisions or choices to be made. So, here the user can click on 'Add' to add a condition. This then opens up a new blank template screen, which can be populated similarly with equations and text etc. The condition will also capture the logic or decision that will define when the user will go to one step or the other. The conditions could be tied to values in the equations, to choices the users make, to shapes of the image etc. This process can be repeated vertically down one condition to build one branch of a decision tree and horizontally to allow creation of multiple branches. The user can use the commands on the template to navigate up and down the decision branches and from one to another. The user will also be able to decide what the layout of the screen will look like when this process is played back.

g) When the user has completed the capture process, they can then save it under the appropriate database. They can come back to it later and delete, edit or create more.

h) Once it is stored in the database, now a user who is searching can find it and navigate through the new process.

Once a process is captured, the user then saves it in their own personal account, or submits it to their community or to Interneer for review and submission to the entire Interneer user community. If it is reviewed and accepted, then it is deployed to other users in the community or to the Interneer community as a whole.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PASSWORD:
Login
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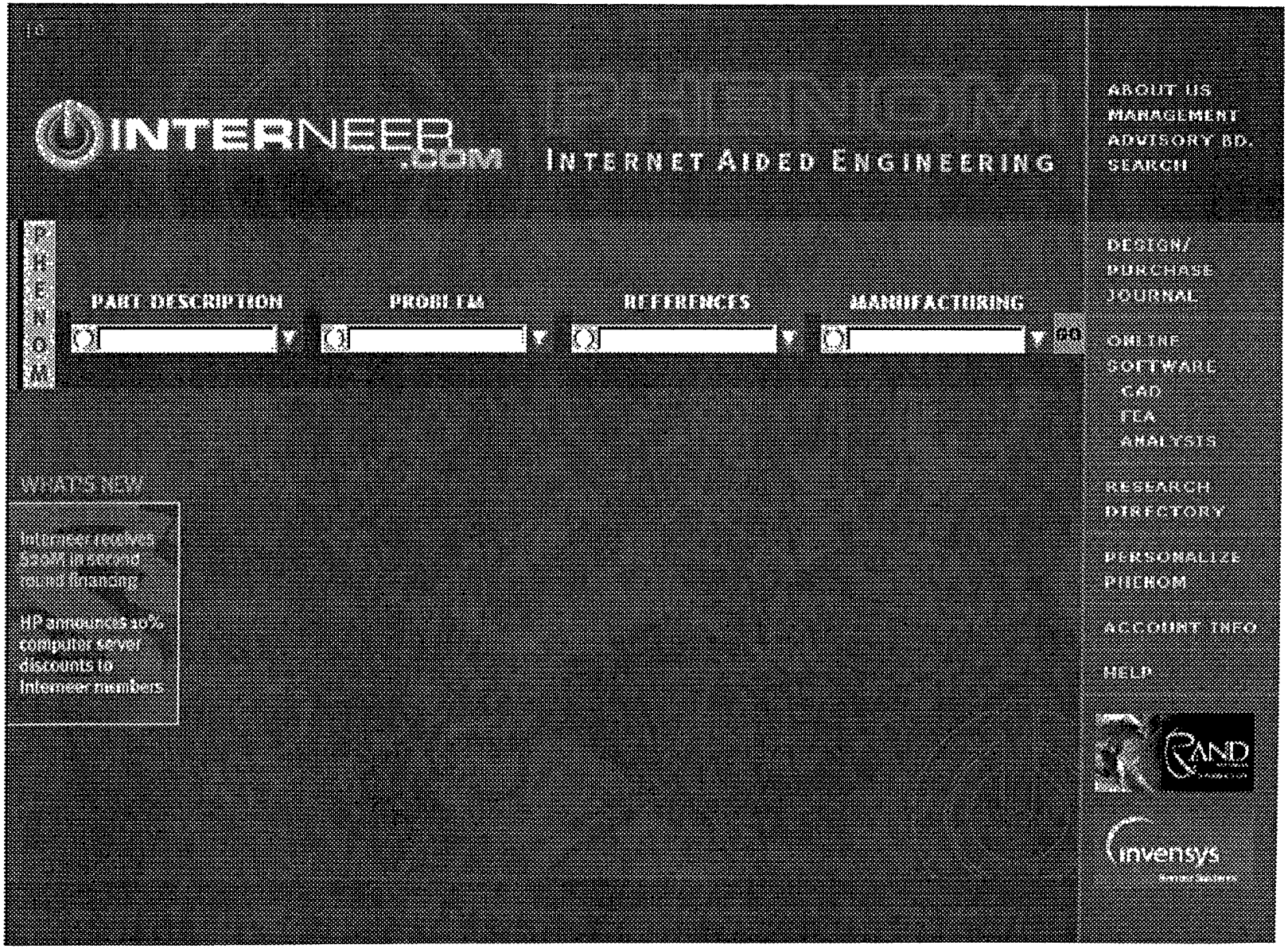
Figure 1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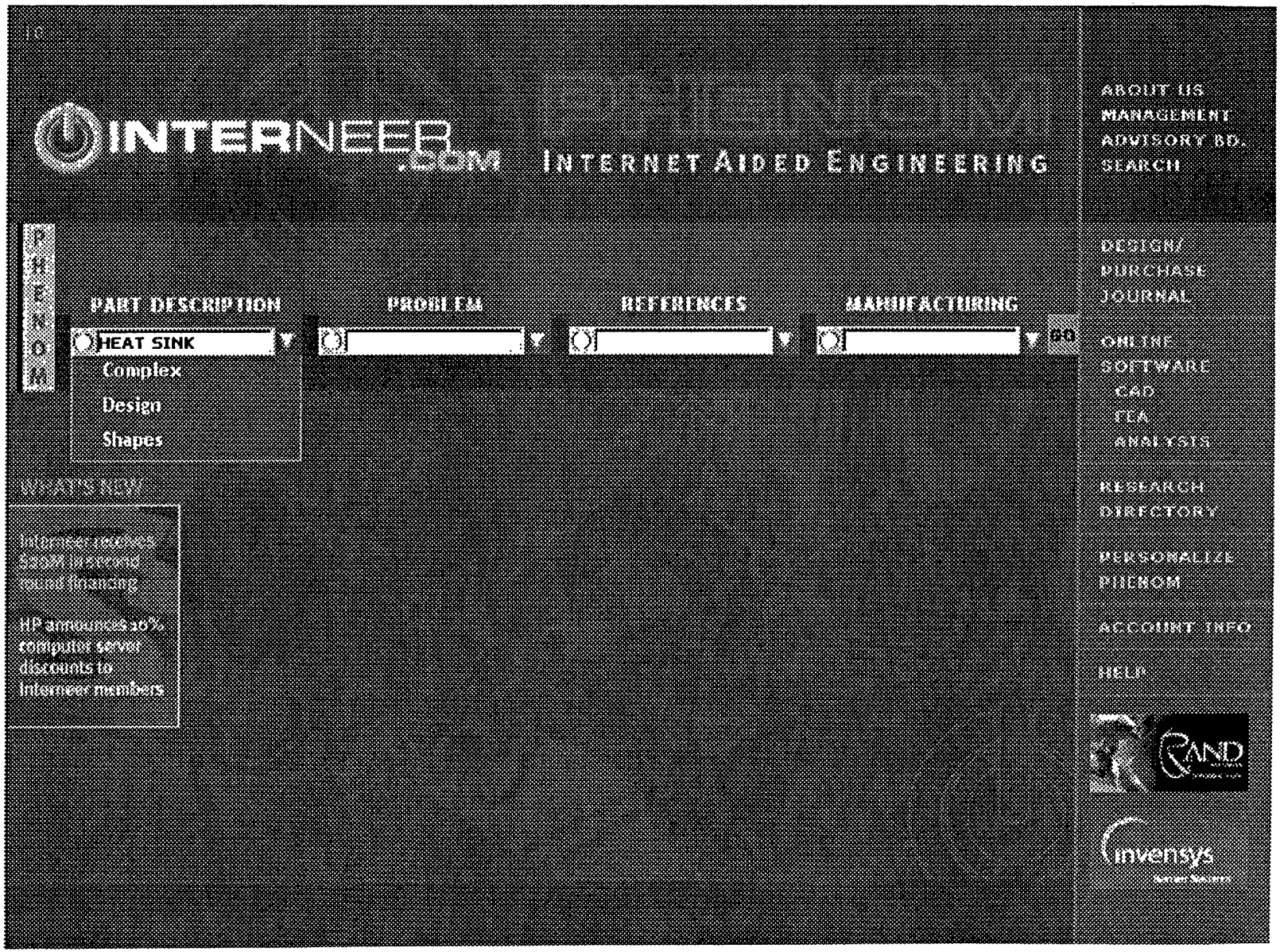
RESEARCH
DIRECTORY
PERSONALIZE
PHEROM
ACCOUNT INFO
HELP
PART DESCRIPTION
PROBLEM
REFERENCES
MANUFACTURING
GO
WHAT'S NEW
HP announces 10% computer server discounts to Interneer members
RAND
Invensys

Figure 2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ACCOUNT INFO
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PART DESCRIPTION
PROBLEM
REFERENCES
MANUFACTURING
GO
HEAT SINK
Complex
Design
Shapes
WHAT'S NEW
Interneer receives $500K in seed round financing
HP announces 10% computer server discounts to Interneer members
RAND
invensys

Figure 3

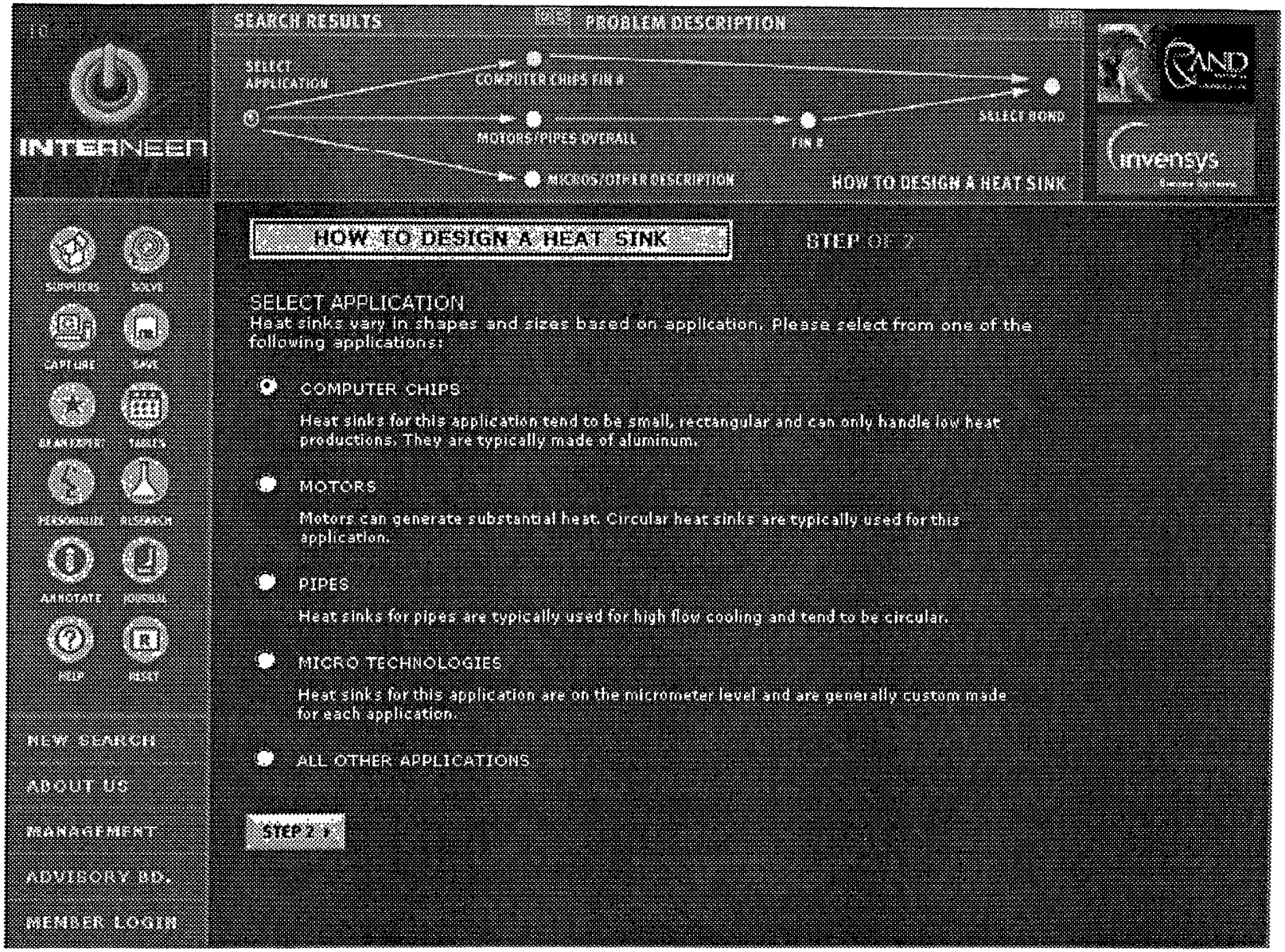

SEARCH RESULTS
PROBLEM DESCRIPTION
SELECT APPLICATION
COMPUTER CHIPS FIN #
MOTORS/PIPES OVERALL
FIN #
SELECT BOND
MICROS/OTHER DESCRIPTION
HOW TO DESIGN A HEAT SINK
INTERNEEN
Invensys
HOW TO DESIGN A HEAT SINK
STEP
SELECT APPLICATION
Heat sinks vary in shapes and sizes based on application. Please select from one of the following applications:
COMPUTER CHIPS
Heat sinks for this application tend to be small, rectangular and can only handle low heat productions. They are typically made of aluminum.
MOTORS
Motors can generate substantial heat. Circular heat sinks are typically used for this application.
PIPES
Heat sinks for pipes are typically used for high flow cooling and tend to be circular.
MICRO TECHNOLOGIES
Heat sinks for this application are on the micrometer level and are generally custom made for each application.
ALL OTHER APPLICATIONS
NEW SEARCH
ABOUT US
MANAGEMENT
ADVISORY BD.
MEMBER LOGIN

Figure 4

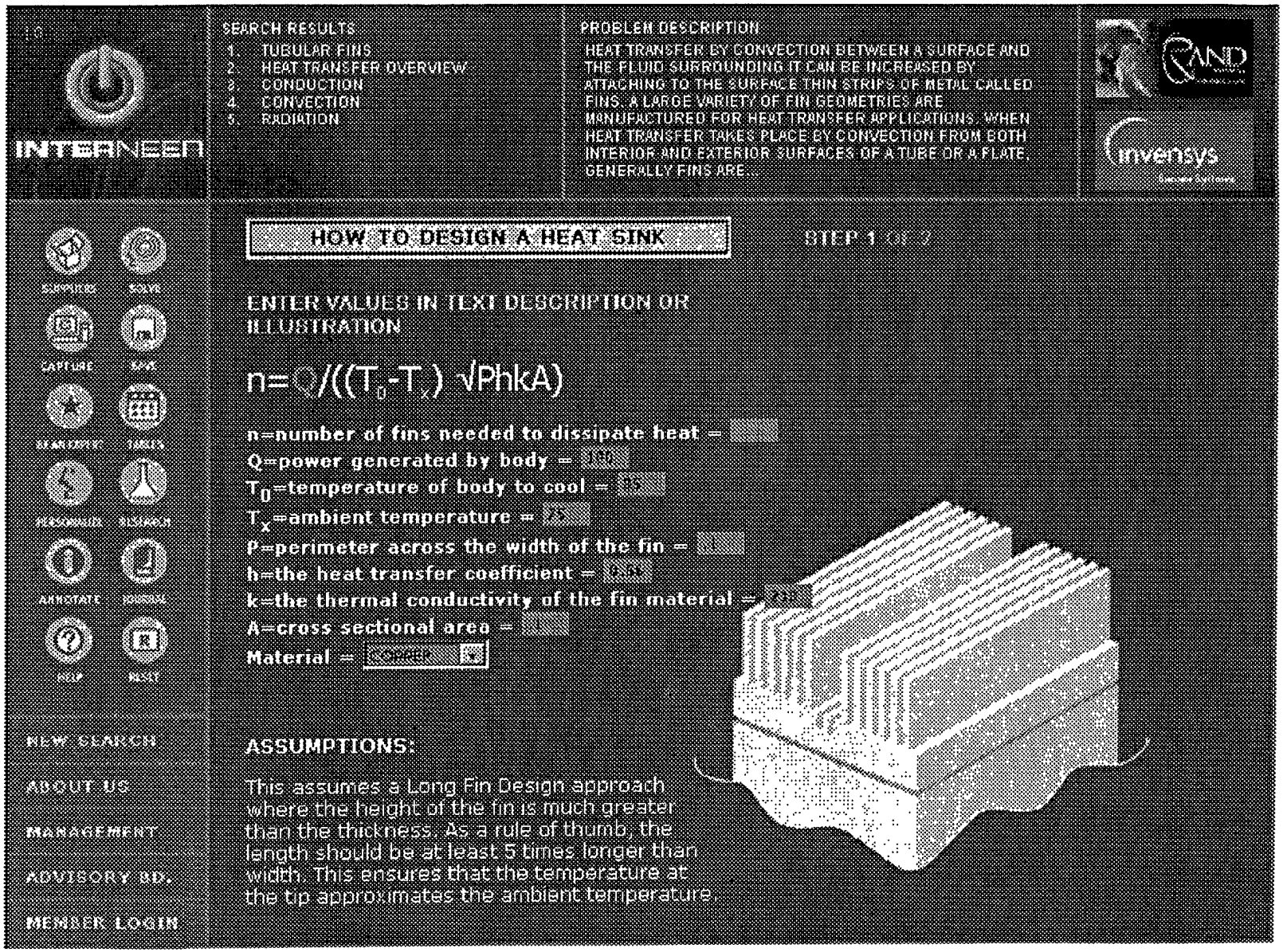

INTERNEEN
SEARCH RESULTS
1. TUBULAR FINS
2. HEAT TRANSFER OVERVIEW
3. CONDUCTION
4. CONVECTION
5. RADIATION
PROBLEM DESCRIPTION
HEAT TRANSFER BY CONVECTION BETWEEN A SURFACE AND THE FLUID SURROUNDING IT CAN BE INCREASED BY ATTACHING TO THE SURFACE THIN STRIPS OF METAL CALLED FINS. A LARGE VARIETY OF FIN GEOMETRIES ARE MANUFACTURED FOR HEAT TRANSFER APPLICATIONS. WHEN HEAT TRANSFER TAKES PLACE BY CONVECTION FROM BOTH INTERIOR AND EXTERIOR SURFACES OF A TUBE OR A PLATE, GENERALLY FINS ARE...
Invensys
HOW TO DESIGN A HEAT SINK
ENTER VALUES IN TEXT DESCRIPTION OR ILLUSTRATION
$n=Q/((T_0-T_x)\sqrt{PhkA})$
n=number of fins needed to dissipate heat =
Q=power generated by body =
T_0=temperature of body to cool =
T_x=ambient temperature =
P=perimeter across the width of the fin =
h=the heat transfer coefficient =
k=the thermal conductivity of the fin material =
A=cross sectional area =
Material =
ASSUMPTIONS:
This assumes a Long Fin Design approach where the height of the fin is much greater than the thickness. As a rule of thumb, the length should be at least 5 times longer than width. This ensures that the temperature at the tip approximates the ambient temperature.
NEW SEARCH
ABOUT US
MANAGEMENT
ADVISORY BD.
MEMBER LOGIN

Figure 5

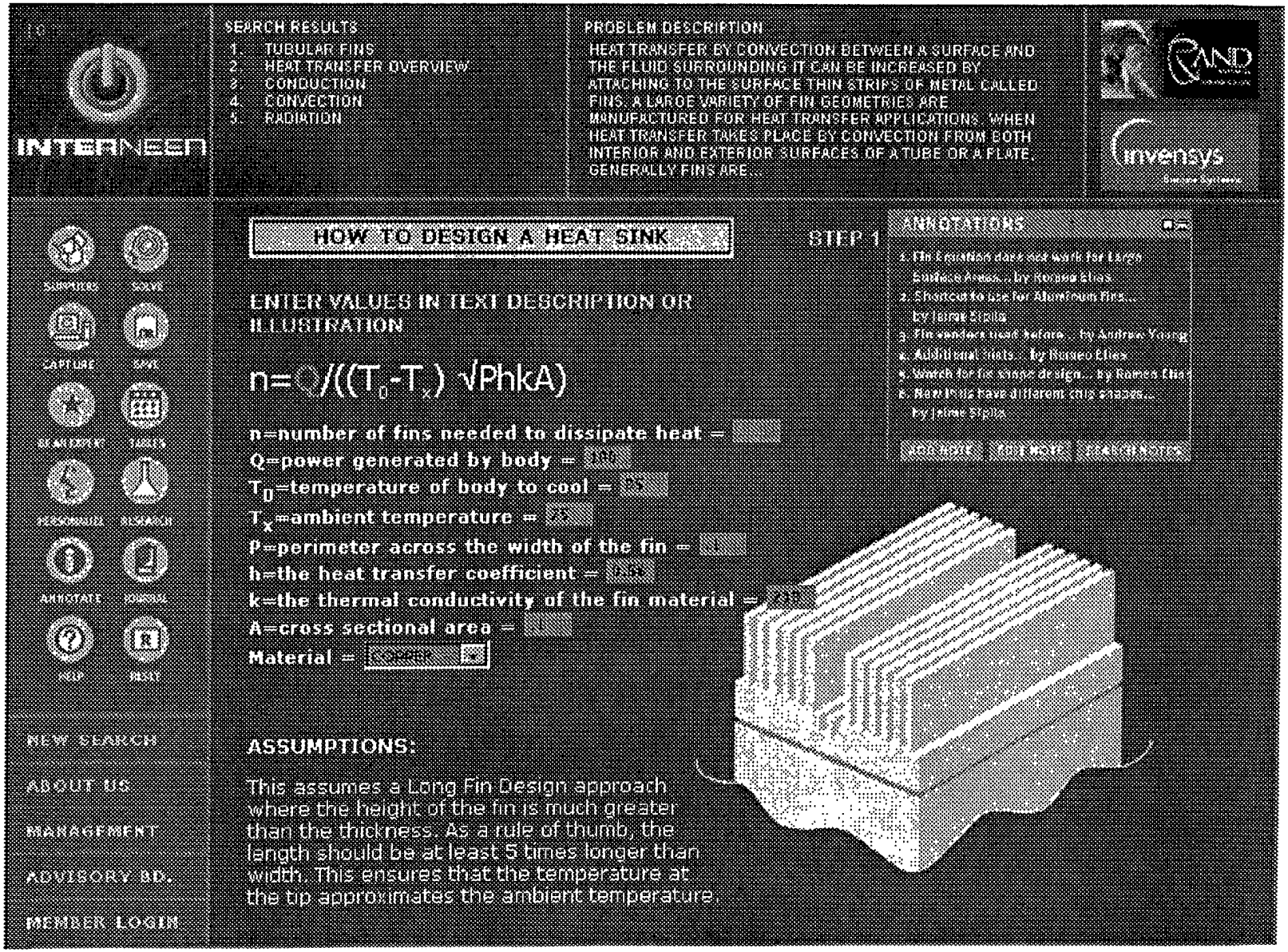

INTERNEEN
SEARCH RESULTS
1. TUBULAR FINS
2. HEAT TRANSFER OVERVIEW
3. CONDUCTION
4. CONVECTION
5. RADIATION
PROBLEM DESCRIPTION
HEAT TRANSFER BY CONVECTION BETWEEN A SURFACE AND THE FLUID SURROUNDING IT CAN BE INCREASED BY ATTACHING TO THE SURFACE THIN STRIPS OF METAL CALLED FINS. A LARGE VARIETY OF FIN GEOMETRIES ARE MANUFACTURED FOR HEAT TRANSFER APPLICATIONS. WHEN HEAT TRANSFER TAKES PLACE BY CONVECTION FROM BOTH INTERIOR AND EXTERIOR SURFACES OF A TUBE OR A PLATE, GENERALLY FINS ARE...
RAND
invensys
HOW TO DESIGN A HEAT SINK
STEP 1
ANNOTATIONS
ENTER VALUES IN TEXT DESCRIPTION OR ILLUSTRATION
n=Q/((T0-Tx) √PhkA)
n=number of fins needed to dissipate heat =
Q=power generated by body =
T0=temperature of body to cool =
Tx=ambient temperature =
P=perimeter across the width of the fin =
h=the heat transfer coefficient =
k=the thermal conductivity of the fin material =
A=cross sectional area =
Material =
Copper
ASSUMPTIONS:
This assumes a Long Fin Design approach where the height of the fin is much greater than the thickness. As a rule of thumb, the length should be at least 5 times longer than width. This ensures that the temperature at the tip approximates the ambient temperature.
NEW SEARCH
ABOUT US
MANAGEMENT
ADVISORY BD.
MEMBER LOGIN

Figure 6

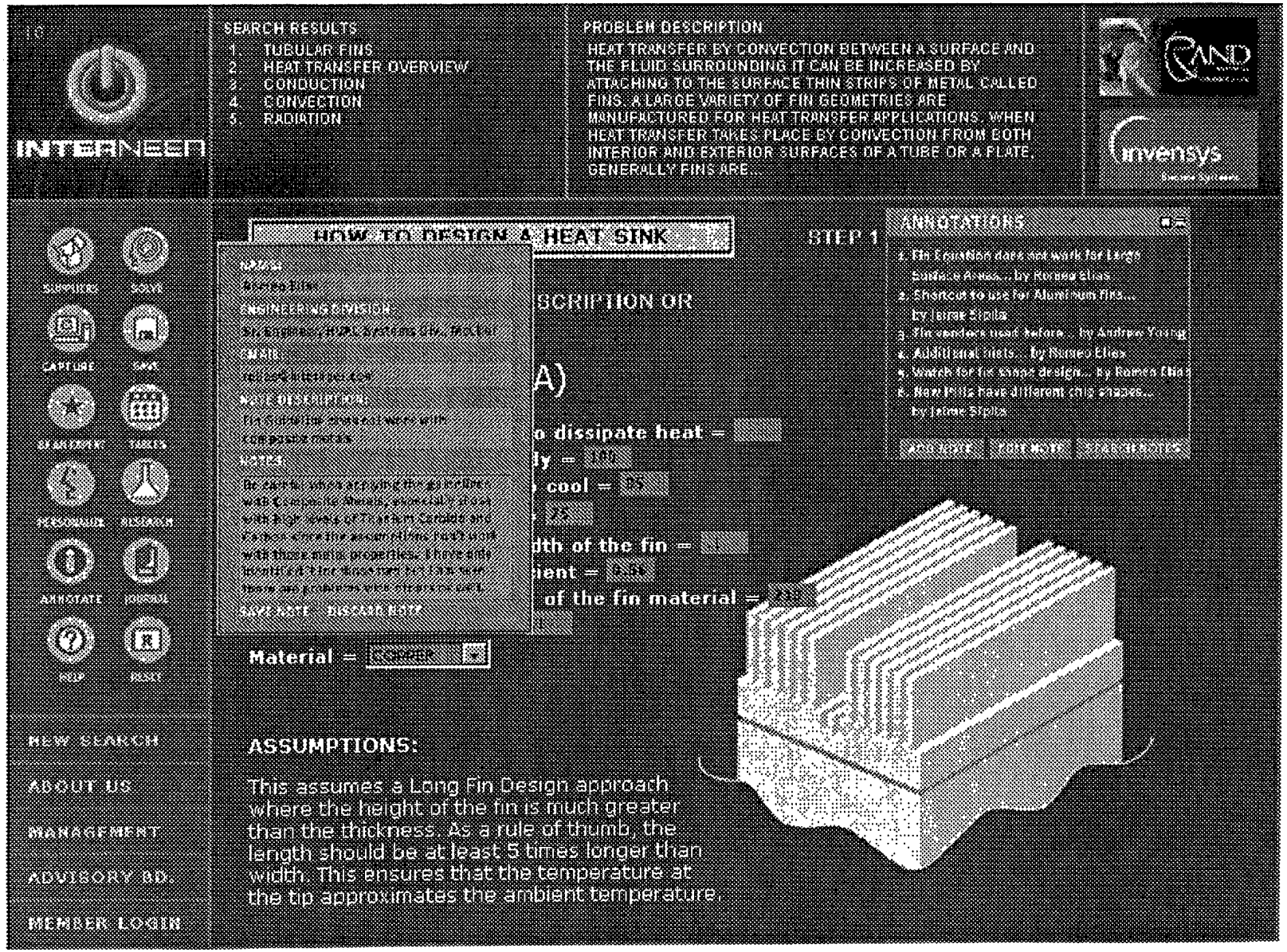

INTERNEEN
SEARCH RESULTS
1. TUBULAR FINS
2. HEAT TRANSFER OVERVIEW
3. CONDUCTION
4. CONVECTION
5. RADIATION
PROBLEM DESCRIPTION
HEAT TRANSFER BY CONVECTION BETWEEN A SURFACE AND THE FLUID SURROUNDING IT CAN BE INCREASED BY ATTACHING TO THE SURFACE THIN STRIPS OF METAL CALLED FINS. A LARGE VARIETY OF FIN GEOMETRIES ARE MANUFACTURED FOR HEAT TRANSFER APPLICATIONS. WHEN HEAT TRANSFER TAKES PLACE BY CONVECTION FROM BOTH INTERIOR AND EXTERIOR SURFACES OF A TUBE OR A PLATE, GENERALLY FINS ARE...
invensys
HOW TO DESIGN A HEAT SINK
STEP 1
ANNOTATIONS
Material =
ASSUMPTIONS:
This assumes a Long Fin Design approach where the height of the fin is much greater than the thickness. As a rule of thumb, the length should be at least 5 times longer than width. This ensures that the temperature at the tip approximates the ambient temperature.
NEW SEARCH
ABOUT US
MANAGEMENT
ADVISORY BD.
MEMBER LOGIN

Figure 7

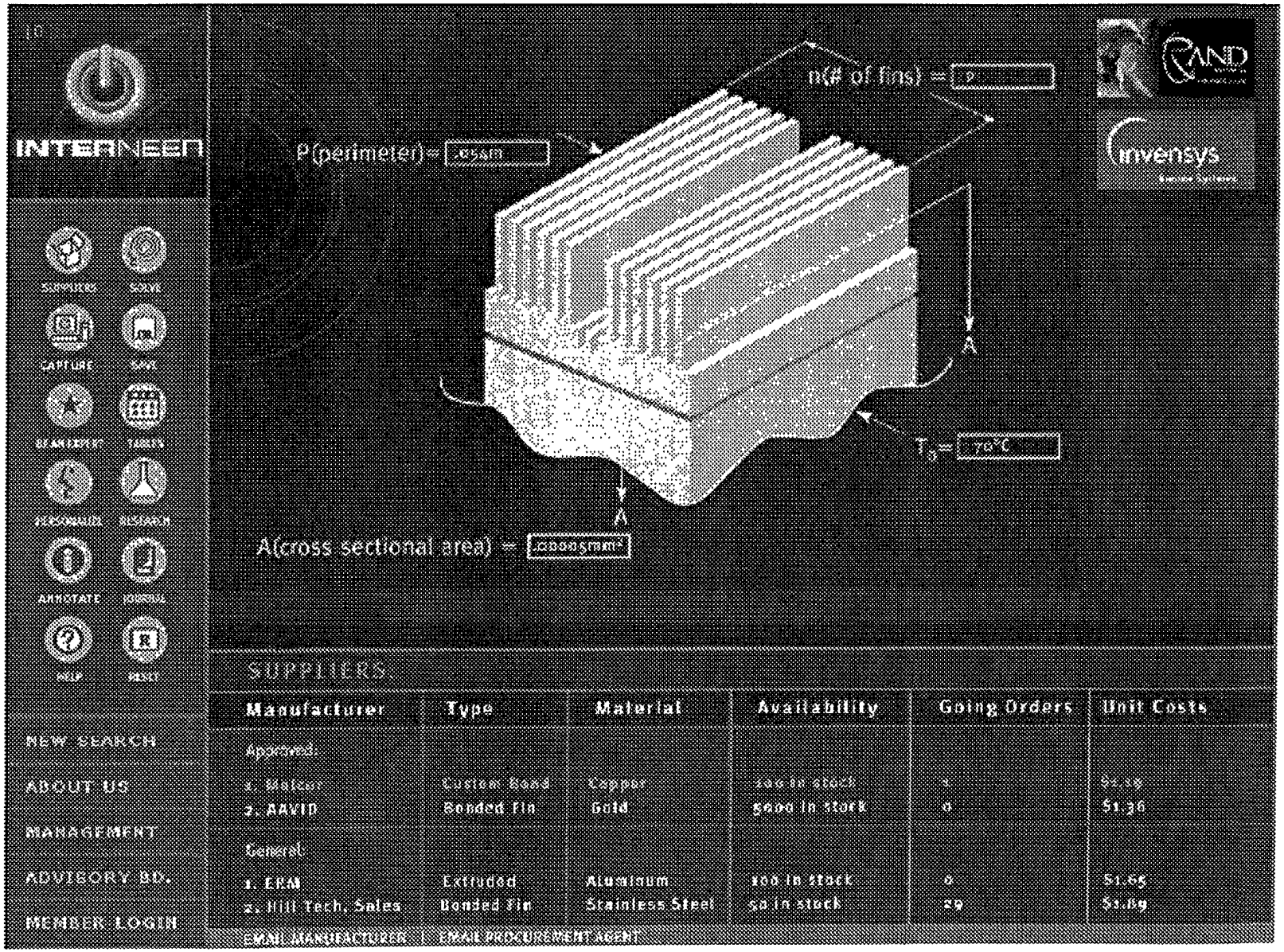

INTERNEER
n(# of fins) =
P(perimeter) =
A(cross sectional area) =
SUPPLIERS
Manufacturer
Type
Material
Availability
Going Orders
Unit Costs
NEW SEARCH
ABOUT US
MANAGEMENT
ADVISORY BD.
MEMBER LOGIN

Figure 8

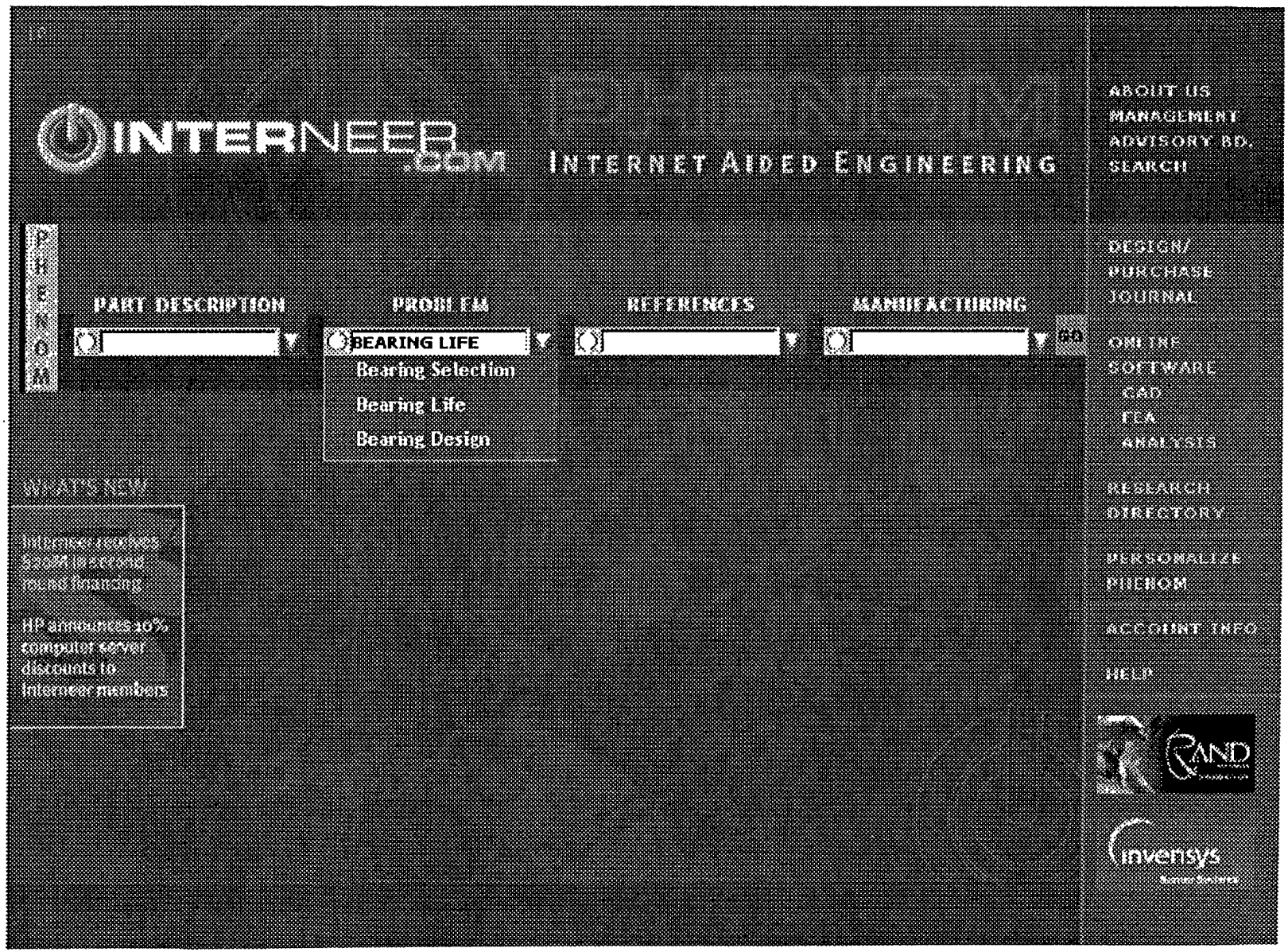

INTERNEER .COM
INTERNET AIDED ENGINEERING
ABOUT US
MANAGEMENT
ADVISORY BD.
SEARCH
DESIGN/
PURCHASE
JOURNAL
ONLINE
SOFTWARE
CAD
FEA
ANALYSIS
RESEARCH
DIRECTORY
PERSONALIZE
PINBOARD
ACCOUNT INFO
HELP
PART DESCRIPTION
PROBLEM
REFERENCES
MANUFACTURING
GO
BEARING LIFE
Bearing Selection
Bearing Life
Bearing Design
WHAT'S NEW
HP announces 40% computer server discounts to Interneer members
RAND
invensys

Figure 9

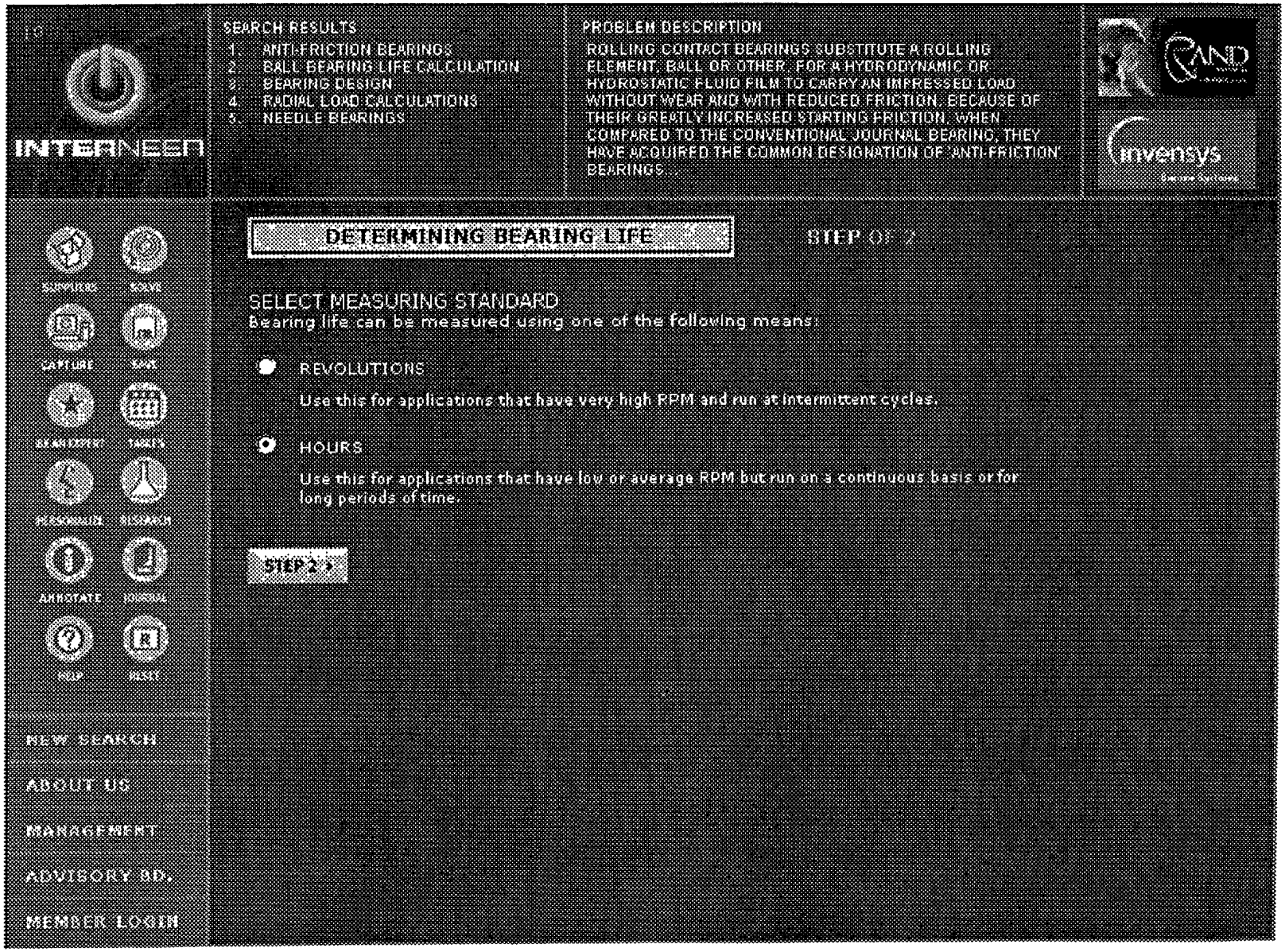
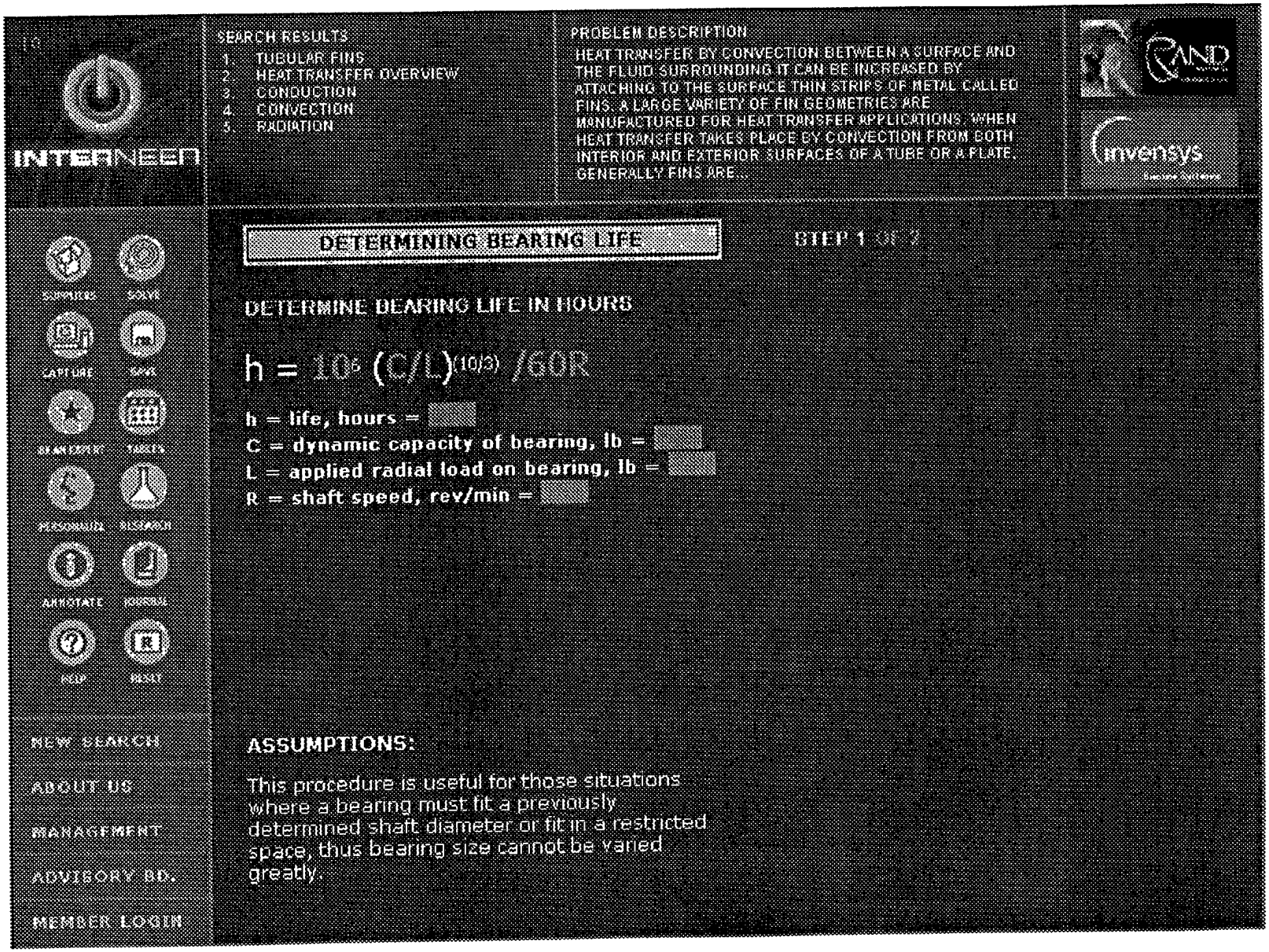

INTERNEEN
SEARCH RESULTS
1. ANTI-FRICTION BEARINGS
2. BALL BEARING LIFE CALCULATION
3. BEARING DESIGN
4. RADIAL LOAD CALCULATIONS
5. NEEDLE BEARINGS
PROBLEM DESCRIPTION
ROLLING CONTACT BEARINGS SUBSTITUTE A ROLLING ELEMENT, BALL OR OTHER, FOR A HYDRODYNAMIC OR HYDROSTATIC FLUID FILM TO CARRY AN IMPRESSED LOAD WITHOUT WEAR AND WITH REDUCED FRICTION. BECAUSE OF THEIR GREATLY INCREASED STARTING FRICTION, WHEN COMPARED TO THE CONVENTIONAL JOURNAL BEARING, THEY HAVE ACQUIRED THE COMMON DESIGNATION OF 'ANTI-FRICTION' BEARINGS.
RAND
invensys
DETERMINING BEARING LIFE
STEP OF 2
SELECT MEASURING STANDARD
Bearing life can be measured using one of the following means:
REVOLUTIONS
Use this for applications that have very high RPM and run at intermittent cycles.
HOURS
Use this for applications that have low or average RPM but run on a continuous basis or for long periods of time.
STEP 2 >
NEW SEARCH
ABOUT US
MANAGEMENT
ADVISORY BD.
MEMBER LOGIN

Figure 9A


INTERNEEN
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invensys
DETERMINING BEARING LIFE
STEP 1
DETERMINE BEARING LIFE IN HOURS
h = 10^6 (C/L)^(10/3) /60R
h = life, hours =
C = dynamic capacity of bearing, lb =
L = applied radial load on bearing, lb =
R = shaft speed, rev/min =
ASSUMPTIONS:
This procedure is useful for those situations where a bearing must fit a previously determined shaft diameter or fit in a restricted space, thus bearing size cannot be varied greatly.
NEW SEARCH
ABOUT US
MANAGEMENT
ADVISORY BD.
MEMBER LOGIN

Figure 10

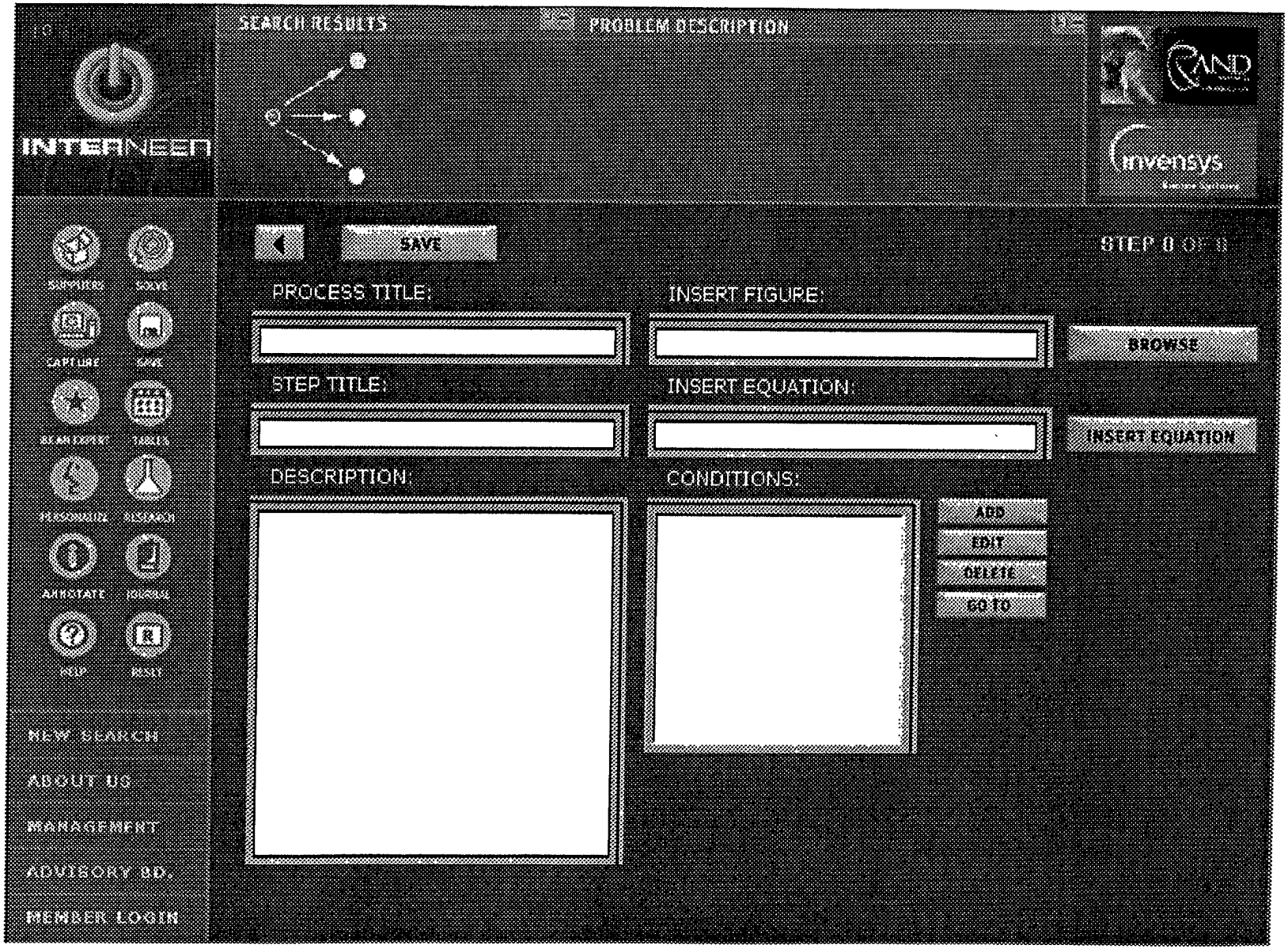
SEARCH RESULTS
PROBLEM DESCRIPTION
INTERNEER
invensys
SAVE
STEP 0 OF 0
PROCESS TITLE:
INSERT FIGURE:
BROWSE
STEP TITLE:
INSERT EQUATION:
INSERT EQUATION
DESCRIPTION:
CONDITIONS:
ADD
EDIT
DELETE
GO TO
NEW SEARCH
ABOUT US
MANAGEMENT
ADVISORY BD.
MEMBER LOGIN

Figure 11

LONG FIN DESIGN

n=(Q.^3 + Q + 10)/((T0-Tx)*sqrt(P*h*k*A)) + 10 n = -1.0990e+005

n=number of fins needed to dissipate heat

Q=power generated by body	100
T0=temperature of body to cool	75
Tx=ambient temperature	85
P=perimeter across the width of the fin	.1
h=the heat transfer coefficient	.3
k=the thermal conductivity of the fin material	120
A=cross sectional area	.23

Solve for n

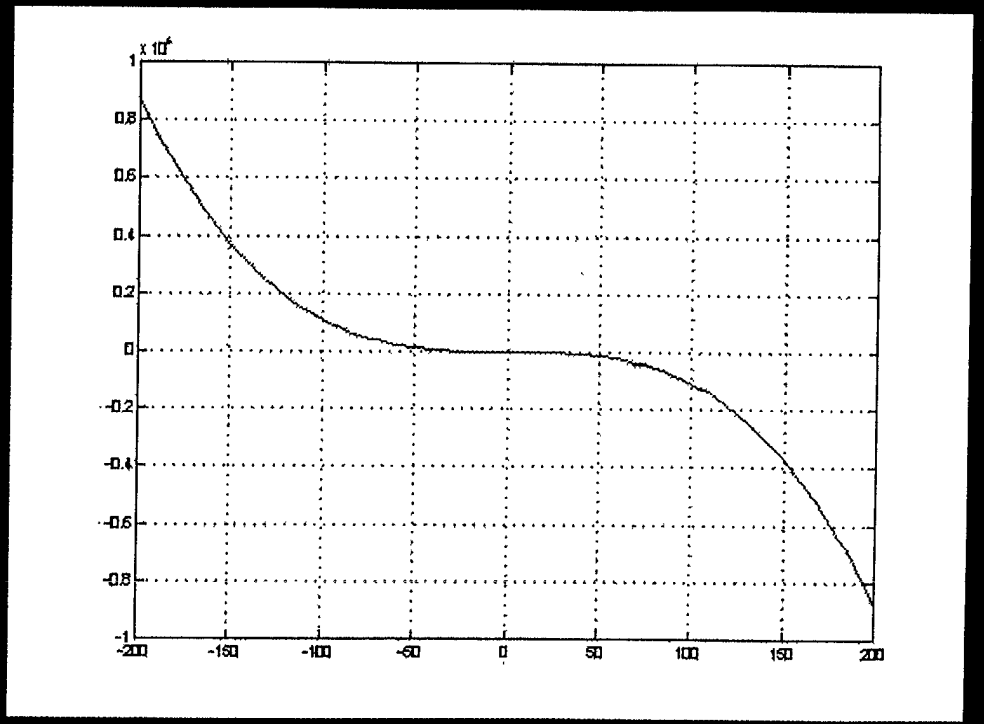

Figure 12

APPENDIX B

156347-0006/P02168US
Express Mail Label No.: EL 652 561 016 US

Provisional Patent Application

for

KNOWLEDGE MANAGEMENT AND INFORMATION DEPLOYMENT METHOD AND SYSTEM

INVENTORS

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Robert Jew 1540 Centinela #111 Los Angeles, CA 90025	**Kevin Burke** 782 Linda Vista Ave. Pasadena, CA 91103	**Shahram Sharafat** PO Box 24646 Los Angeles, CA 90024

Summary

Interneer is an engineering software development firm providing an integrated platform for accelerating product design. From product concept to final procurement Interneer cuts engineering costs and time to market by: delivering essential mechanical engineering information and tools through an expert system; by capturing and deploying the valuable knowledge assets of client firms; and, by enabling ongoing collaboration between engineering product/service providers and their markets. Interneer's revenue flows from software license fees, vendor commissions, and ASP offerings.

The Need

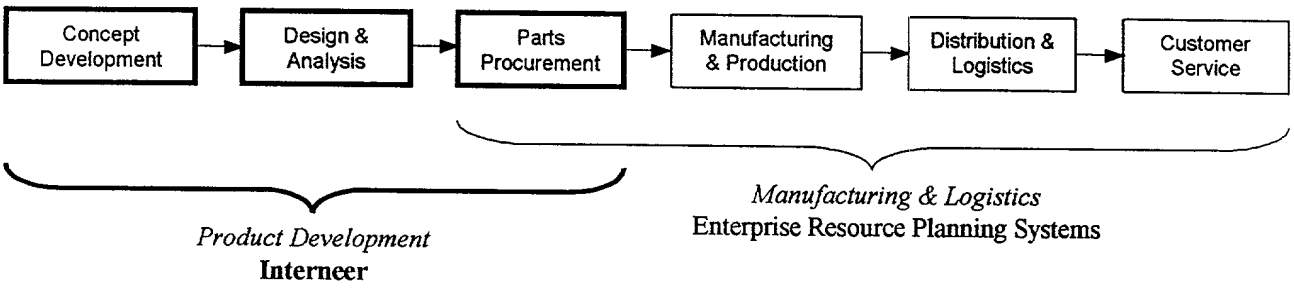
Engineers spend an average of 25 percent of their professional time performing calculations and searching for information such as specifications, equations, material properties, guidelines and data. Vendor identification, parts specification, and procurement further add to the expense and delay of product development. Engineering companies also lack resources to mine knowledge developed internally by their engineers.

The Offering

Interneer cuts engineering costs and product time to market by delivering engineering information, tools and guidance in a timely manner. Interneer's back-end databases will provide key engineering data and equations - retrieved via an intelligent and interactive expert system - instant procurement and outsourcing, and on-line CAD (Computer Aided Design), CAM (Computer Aided Manufacturing) and FEA (Finite Element Analysis) server run applications. In addition, Interneer provides the ability for companies to build their own proprietary knowledge databases that are seamlessly integrated with Interneer's existing databases.

Key Positioning in the Development Product Cycle

Interneer occupies an essential position in the product development cycle by guiding product design and specification. 80 percent of a product's value is determined at this stage. The unique ability to influence parts and vendor selection as engineering designs unfold makes Interneer unusually valuable to vendors. Interneer monetizes parts specification and aggregate procurement through vendor commissions.



Market and Competitive Analysis

Market Profile

Interneer's initial target market is small and medium scale engineering design and manufacturing firms. This includes 54,000 mechanical engineering design and consulting firms. These smaller firms cannot bear the expense of comprehensive engineering information technology infrastructure and design software. Interneer's cost-saving, integrated solution will become indispensable to their product development process.

Summary of Value Proposition

Interneer delivers a comprehensive, integrated product development solution on a single platform. Compelling benefits exist for all stakeholders:

Value for Engineering and Manufacturing Firms

- **Savings** – Lower engineering and manufacturing costs
- **Speed** – Reduce product time to market
- **Coordination** – Connect engineers with marketing, procurement and manufacturing

Value for End-User Engineers

- **Simplicity** – Intuitive, interactive, simple interface, with back-end sophistication
- **Convenience** – Search, point, click, print; No leg-work; Direct link to suppliers
- **Access** – To project and team information anywhere

Value for Part and Component Vendors

- **Access** – Direct, convenient access to engineers with purchasing authority
- **Market Lock-in** – Create ongoing returns by locking their parts into products at the point of design

The Product

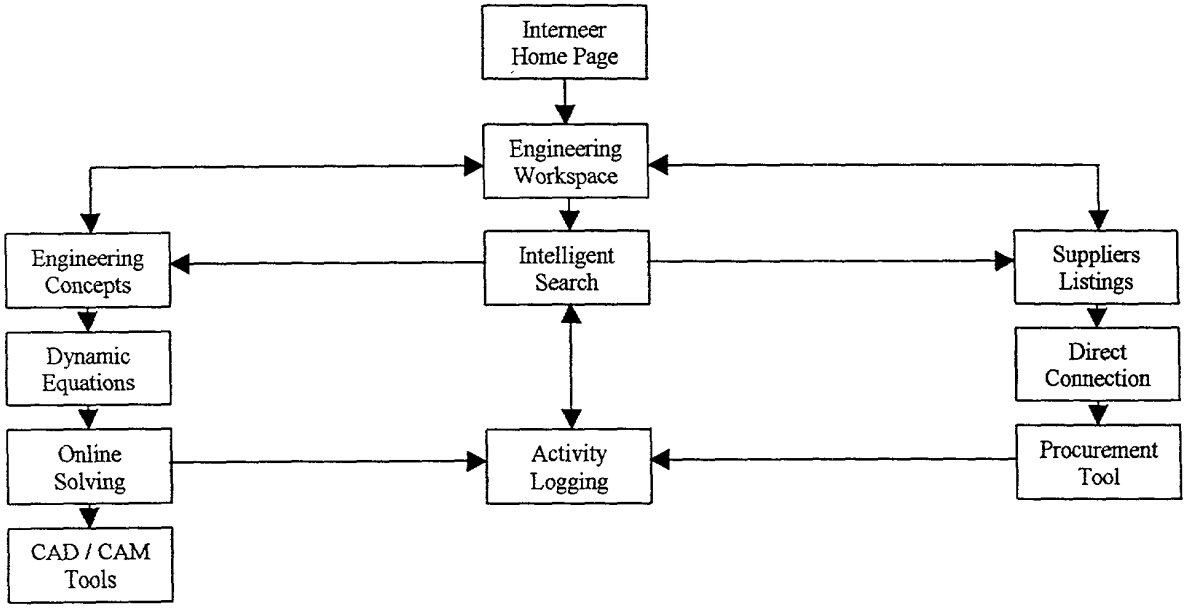
Product Description

Interneer delivers Internet Aided Design (IAD) and Internet Aided Engineering (IAE) software and will later include Internet Aided Manufacturing (IAM). This software allows engineers to search for and interact with information and data quickly and efficiently, allows them to solve technical problems online, and connects them directly with manufacturers and vendors. Subscription paying engineers are provided access to the most widely used engineering information, equations and data (retrieved via an intelligent and interactive search engine), problem solving tools, procurement and outsourcing resources, CAD / CAM / FEA server run applications, and educational resources.

Site Navigation

Figure 2.1 shows the Interneer Process Diagram. The user logs in to their personalized engineering workspace. Once there, users can search for engineering concepts, references and research materials, manufacturers, and vendors of either off-the-shelf products or custom parts. They also have access to online CAD/CAM ASP tools; available with a simple click. The software will be composed of 4 main sections described in the following subsections.

Figure 2.1 – Product Process Diagram



Intelligent Search Engine

The search engine is knowledge and meaning based to simplify and expedite information retrieval. For example, consider an engineer requesting information to answer the question, "What oil should I use to dampen gearbox noise?" Interneer then responds with a number of clarifying choices: "Do you want to improve gearbox performance? Do you want to reduce gearbox noise?" Etc. The user can also be provided with links to information on gears within the site as well as links to manufacturers of gears and the gear yellow pages depending on their search specifications.

In addition to these concept (question/answer) types of searches, users will be able to enter keywords that will be interpreted by the expert system. They will then be guided to the best solution via multiple layers of dropdown lists. These lists are driven by knowledge created both by Interneer and the users themselves.

Interactive and Concise Content with Problem Solving Tools

Interneer will have a database of the most widely used equations, data and charts used by our customers. Topics will be compiled from surveys conducted on working engineers and will include:

- **Technical content** – Concise and structured and offered in layers of increasing depth
- **Problem solving tools** - Interactive equations and explanations of equations
- **User interactivity** – For example, viewing graph of particle velocity versus time is interactive so that new data can be generated in real-time if time axis changed to distance
- **ASP resources** – CAD, CAM or FEA
- **Graphical Resources** – Charts / graphs and Tables of various data such as material properties
- **Tables and graphs** – Categorized and searchable by keywords
- **Material properties data** – Selected from drop down lists in our database or from manually entered data if not available in the database
- **Units** – Selected dynamically and for each separate equation variable

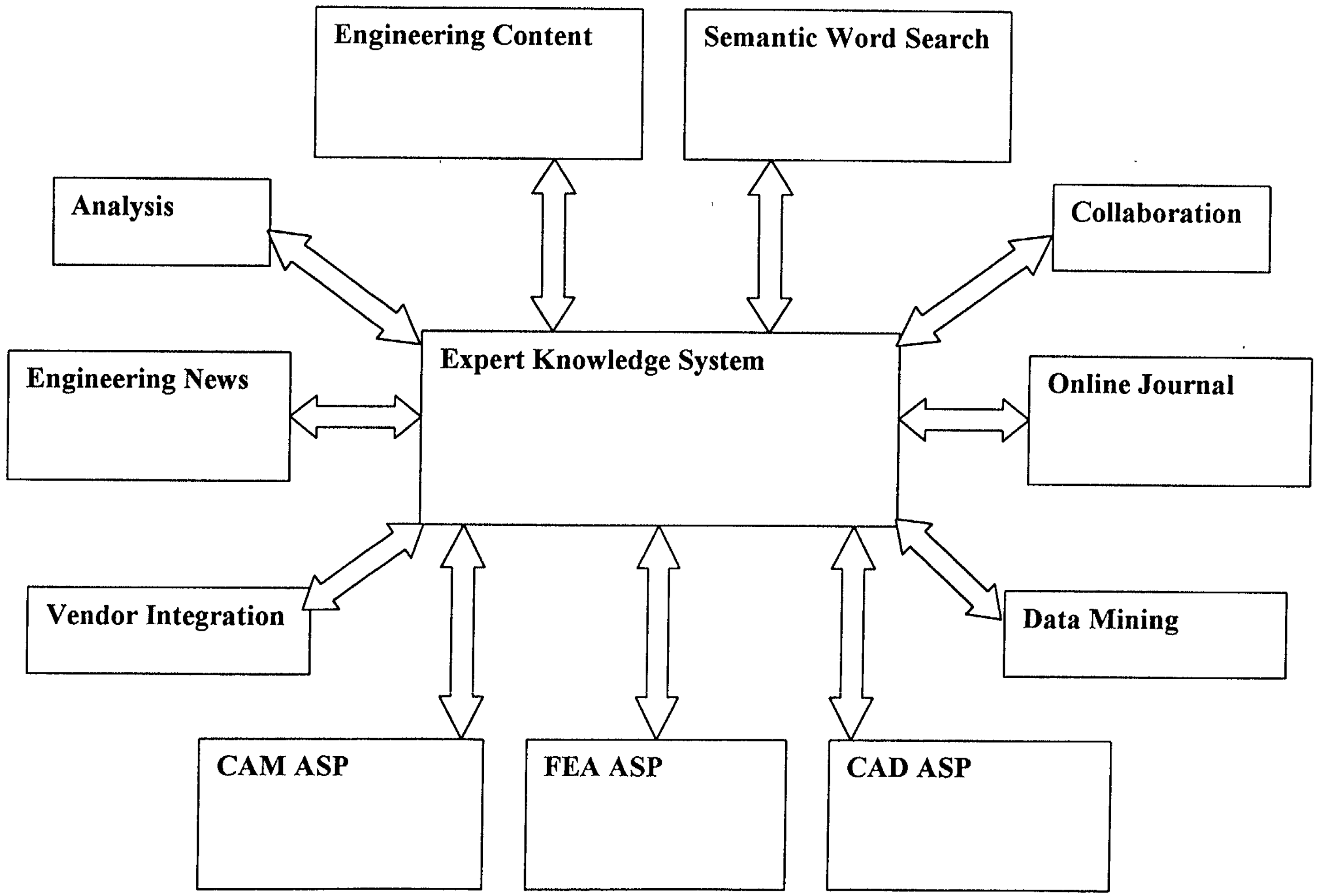
Users will also be able to compile their own knowledge by entering information into an online knowledge management template. This information will be available exclusively to them, but will be seamlessly integrated with Interneer's existing knowledge base, after being validated through the company's review/approval process. This allows companies to build their own tools and resources and to organize the cumulated knowledge of their engineers so that it can be passed on to new hires and current employees simply and efficiently. Experienced engineers will then be relieved to some extent from training and supervision, thus freeing up time for more meaningful work.

Direct Access to Manufacturers / Vendors / Contractors

Upon designing and specifying needed parts, engineers are provided direct access to the providers of these parts.

As equations are solved online, lists of links to manufacturers of the designed parts are presented along with detailed information, availability / lead-time and cost. Users can purchase needed parts on Interneer and directly communicate between their procurement agent and the provider. With one simple click, an email can be sent to the company procurement agent with detailed information on the part along with ordering information, thus simplifying the job of the procurement agent.

Figure 2.2 – Product Family Diagram



User Activity Log

This feature tracks users' daily work activities and is an essential time saving tool, given that engineers often refer to their previous work. Elements to the log include

- **Daily Activities** – Online dynamic tracking application that stores user activities as they solve problems
- **Control** – Users can elect to save instances of their work in real-time or opt to automatically have it logged
- **Historical data** – Log keeps track of pages viewed, equations utilized, data inputted into equations, manufacturers references, parts bought, etc.
- **Stickiness** – Log is non-transferable or downloadable and is stored on the Interneer servers

Server Run Applications

Interneer will provide Computer Aided Design (CAD), Finite Elements and Computer Aided Manufacturing (CAM) tools online, available on a pay per use basis. These tools will complete the package making Interneer the complete solution for engineers.

Figure 2.2 shows the Interneer Product Family Diagram detailing the various components that make up the Interneer product and their respective connections.

Launch

The Interneer website is being developed and deployed in three stages as outlined in Table 2.1. The following subsections describe in detail the process.

Table 2.1 – Interneer Website Deployment

Release Version	Description / Enhancement
Beta Version	• Overall Planning and Design of Website • Intelligent Search Engine • Interactive and Concise Content
Version 1	• Direct Access to Manufacturing / Vendors / Contractors • User Activity Log
Version 2	• CAD / CAM / FEA ASP

Beta Release

Planning and Design of Website

Design of the Interneer architecture and backend infrastructure is critical at this stage to ensure scalability and robustness. Interneer therefore intends to team with firms with a technical partner or developer with proven success and experience in designing sophisticated backend solutions.

Intelligent Search Engine

Interneer will initially license a knowledge-based search engine such as Ask Jeeves or Excalibur and customize it to fit the engineering content and topics.

Interactive and Concise Content

Interneer is developing exclusive partnerships with engineering content providers such as Industrial Press Inc. Selection of the content has been based on results of industry research among working engineers. Additional effort is underway to begin locking-in additional content partnerships. This courting process is being arranged through Interneer's contact base.

Templates are being created to ease the production of the interactive content. Equations will be stored in a database in a manner that ensures that templates can be used when developing the website. This also reduces development and implementation time.

Interneer Version 1

Direct access and linking to manufacturers / vendors / contractors

Interneer will access vendor parts by initially partnering with the largest and most comprehensive vendors. This strategy will allow Interneer to offer tremendous variety immediately. Interneer will also consider cooperating with MySimon.com or BestBookBuys.com to provide comparison-shopping online. Interneer will also pursue partnerships with GlobalSpec.com, which has an established base of manufacturers and vendors in their database.

User activity log

Interneer stores user activities and keeps track of all transactions performed on website. The data is stored on the Interneer server or within a corporate intranet.

Interneer Version 2

CAD / CAM / FEA ASP

Interneer will pursue partnerships with engineering software providers such as SolidWorks for CAD software, SurfCAM for CAM software and CosmosWorks for FEA software. The potential partner

will be investigated to ensure that the software is transferable to the web to be used as an ASP.

Technology Requirements

Interneer's back end infrastructure and website will be developed using a three-tiered approach. To ensure speed of development of the Beta Site, Interneer will be coded in tier 1 using IIS, Active Server Pages technology and SQL server database. Multiple servers will be deployed in this phase. Load balancing applications such as Big IP will be used. This is crucial to ensure that the site is protected from crashes. The 12 servers are:

- 3 powerful computational servers that handle all online calculation requests including equation results, graphical interactivity and so on. The three servers will share the load ensuring timely responses. These will be hosted with an Internet Web Server Hosting company such as Exodus or Above.net.
- 2 web servers will be used to serve dynamic web pages and for traffic. Microsoft IIS web server running on NT or Windows 2000 platforms will be used. Again, the two servers will be used to balance load. These will be hosted with an Internet Web Server Hosting company such as Exodus or Above.net.
- 2 robust database servers will be used to store and retrieve content and equations. SQL server will be used. The two servers will balance the load. These will be hosted with an Internet Web Server Hosting company such as Exodus or Above.net.
- 3 internal servers (1 computational, 1 web and 1 database) will be used internally for development.
- 2 internal file servers for day-to-day operations and file sharing.

Tier 2 will focus on transferring the Active Server Pages code to COM objects and Active X components. This will ensure faster processing and page serving as traffic to Interneer builds up. Tier 2 implementation will start in the fourth month and correspond with Version 2 release.

Tier 3 will focus on removing bottlenecks. The code will be modified as necessary to ensure both horizontal and vertical scalability and to optimize the technology and add robustness. During this phase, additional servers will be deployed as needed for scalability.

Industry

Industry Assessment

Targeting Fragmented Engineering Business Creates a Favorable Power Balance

Overall 650,000 manufacturers operate in the United States. The vast majority of these are small and medium sized. Interneer's target market is the small and medium (1 to 1000 employees, 1 to 30 engineers) design or manufacturing firm. Small and medium mechanical design firms alone represent 54,000 potential customer companies. The target market is fragmented and collectively has little

leverage to influence prices or demand product features. These customers will have diverse specific needs as well as many common ones. It is Interneer's challenge to create a product that has wide appeal yet compelling value to the target customer. Interneer's advantage is that small firms do not have the financial or technical assets to develop a robust and comprehensive internal engineering portal, nor do they have the disposable income to purchase the array of software packages Interneer will provide. These customers do not have collaborative power to obtain price reductions or employee base to receive significant volume discounts. Interneer provides a cost effective integrated solution for which there is no current, integrated substitute and customers have limited leverage to force price concessions or demand unique product innovation.

Interneer's Wide Market Access Provides Leverage Over Suppliers

Interneer's suppliers are a combination of product suppliers (vendors), software companies (sales and rental), specialized software developers (to operate proprietary software to run the site) and reference materials (texts, specs). Product suppliers have limited power. Many of the vendors of products for mechanical engineering offer commodity goods, and are therefore replaceable by others. Interneer links product suppliers to end users via a search feature and targeted marketing. Product suppliers compensate Interneer for click-throughs and commissions on sales. Initially, product suppliers will have power over Interneer as site traffic and market penetration are low. However, as Interneer generates a larger subscriber base, Interneer will be able to command more favorable commission rates as the impact of not being represented as an Interneer vendor will increase. Software suppliers will have the most power over Interneer as they provide unique products that are demanded by customers. There are only a handful of credible software packages for design and analysis. With such limited choices, the suppliers have the upper hand and can obtain favorable terms. However, by offering superior access to engineers, Interneer will regain advantage by locking up the market.

Head-off Competition Through Exclusive Partnerships and Aggressive Marketing

No single supplier provides an integrated service and commands significant market share. As stated, Interneer's goal is to offer integrated service and do it first. However, it is expected that new entrants will jump in if the market opportunity looks good enough. Before new competition emerges, Interneer will seek exclusive partnerships with key information providers. When competition emerges, Interneer will execute aggressive marketing and branding strategies to maintain control of market share. Interneer is expecting competition and it values competition as the medium by which Interneer's superior product and service differentiation will be demonstrated.

Lock-Up Content and Adapt to New Competition

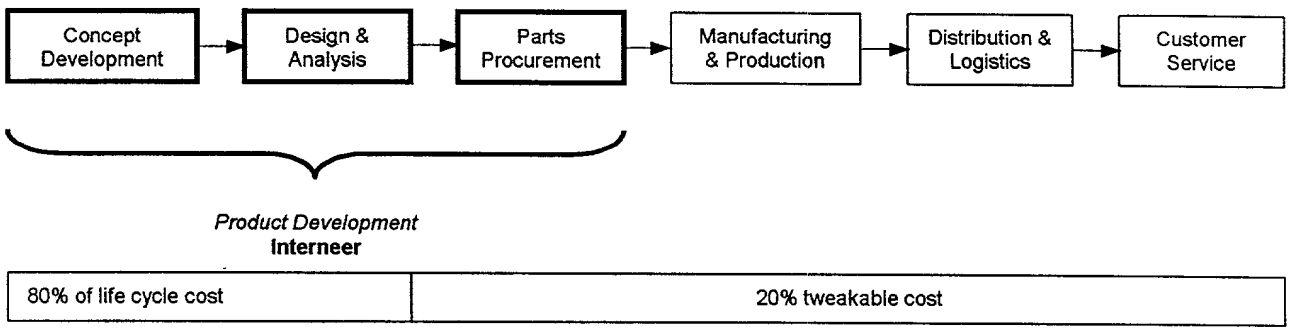
It is the staying power of the existing products that we are trying to displace (Books, Manuals, Catalogues, etc...), and the existing provider's ability to adapt that is a major threat to Interneer. There is also the credible threat of new entrants offering similar products. Interneer again will move quickly to lock up key assets, such as existing reference texts (i.e. Mark's Handbook) and forging alliances

with key software sources (i.e. AutoDesk), to prevent competitors from establishing a strong brand. And finally, compelling new offerings may be put forward by our competition. In response we will adapt by mimicking, licensing, partnering, or improve upon that offering.

Figure 3.1 shows a typical Product Life Cycle diagram and the positioning of Interneer and its competitors in the full cycle. It is clear from the figure that Interneer is positioned to cater to an underserved section of the life cycle diagram. This Product Development stage freezes 80% of the cost of a product. After development and procurement, only 20% of the cost of the product can be effected. Interneer focuses on the former stage, directly reducing costs and streamlining latter stages of the cycle. Interneer will eventually expand along the product value chain to provide services at all stages. Table 3.1 displays a summary of Interneer's features and how they compare to its direct and indirect competitors.

The next sections outline four of Interneer's major competitors. A more extensive list of direct and indirect competitors is contained in the appendix. A brief description of each company's offerings, management team and revenue model is presented. In addition, competitors' weaknesses and differentiation from Interneer are outlined.

Figure 3.1 – Product Life Cycle



Distinguishing Features of Interneer

Interneer distinguishes itself and its services from its competitors in a number of ways including partnerships, marketing and image, features, technology, content, functionality, service, speed and efficiency.

In addition, Interneer is seeking, and will continue to seek, technology and business method patents for all major innovations as they are developed thus erecting barriers to entry. Due to the agility and nature of a startup company, Interneer is more geared to adjust to marketplace needs in contrast to established competitors.

Aggressive Marketing

- **Major Marketing Campaign** – Interneer will undertake a marketing campaign that is comparable in size to consumer market branding, targeting engineers at all levels and utilizing traditional and untraditional methods of advertising. The campaign will be far-reaching and highly creative especially in universities.
- **Indispensable Tool for Engineers** – Interneer will be branded heavily as the choice tool for engineers. The company will be branded as indispensable to engineering students and young engineers.
- **Technical Competence Image** – Interneer will project an image of technical competence and high-tech. This will attract both the young engineer who is looking for the cutting-edge high-tech product and the seasoned engineer who is looking for competence and expertise.
- **Exciting** – Interneer will distinguish itself further by projecting the brand of quality, speed, efficiency, organization, sophistication, freshness and excitement.

Site Content Superiority and Features

- **Integration of Resources** – Interneer will combine the most widely used tools and data for engineers. The information will be provided in the most efficient way based on market research and focus studies conducted on working engineers. The main focus is to save engineers time.
- **Daily Activity Log** – Interneer will track and log engineers' work on the site and provide them the ability to retrieve their work at a future time. This feature will ensure that engineers remain loyal to Interneer since this log can only be accessed from within their user account on Interneer.
- **Continuous Site Updates** – Interneer will continuously update its tools, enhance its content, and introduce new services, ensuring its usefulness to customers and competitiveness in the marketplace.

Functionality

- **Interactive Content** – Interneer will provide its customers much more than the information found on competing sites: Engineers will be able to interact with information in a manner conducive to increasing the efficiency of the engineering process. This means that engineers will be able to learn faster, have shorter design and analysis cycles, and ultimately decrease the time to market of their products.
- **Powerful Controls** – Interneer will provide multiple control and shortcut features that will tailor to more advanced users and will generate a sort of "cult following" who know the ins and outs of the website.
- **One-Stop Destination Site** – Interneer will truly be the one-stop destination site for engineers since it will link them directly to the manufacturers and vendors whose parts and services they seek. The engineer who is seeking answers to a problem will also conveniently find a link to a manufacturer, contractor or vendor during his/her online problem solving session.

Operations Speed and Efficiency

- **Strategic Alliances** – Interneer will seek to form strategic alliances early on with major publishing houses, engineering service providers, manufacturers, and engineering software companies to ensure the best resources for users.
- **Adaptable Website** – Interneer will design the site to quickly adapt to technology changes. This will better serve customers by taking full advantage of the Internet and its potential.
- **Extensive Licensing** – Interneer will seek to license most of its content needs rather than recreate it in order to produce fast result and updates. Whenever possible, we will not 'reinvent the wheel'.

Customer Service

- **Excellent Customer Service** – Interneer will provide excellent customer service along with real-time continuous updates of the content to ensure quality service differentiating Interneer from its competitors.
- **Real-time Discussions with Customers** – Interneer will utilize the latest available technologies to provide online real-time customer service attendants for users.

Marketing

Marketing Analysis

Market Overview

Interneer's market is defined and focused. Small and medium scale mechanical engineering and manufacturing firms (see market segments below) benefit most from Interneer's integrated engineering platform. This is because they lack the infrastructure and resources to implement a similar offering. This market is also fragmented, competitive, and squeezed by global competition. Speed and efficiency are critical to survival, and Interneer meets those companies' needs directly.

Targeted, intensive, marketing and media relations are central to Interneer's business strategy. Many emerging competitor firms, with their technical management, fail to initiate effective, penetrating marketing campaigns. Interneer will focus on building its brand identity – speed, simplicity, innovation, and technical competence – and distinguishing its product as vital and unique.

Revenue Sources

Most of Interneer's revenues are derived from subscription fees paid by small and medium sized mechanical engineering companies. Interneer is targeting smaller firms because they lack the information technology or infrastructure to implement their own portal solution. Interneer plans to automate much of the account activation process by placing it on the web, reducing Interneer's transaction costs.

Growth Potential

The growth of an Internet industry is inherently difficult to measure. However, InPart, an Internet engineering service company with a very similar market to Interneer provides a database of CAD standard parts and associated vendors, and has maintained a growth rate of over 400% over the first two years of operation, a rate which Interneer believes is achievable in its market.

Customer Profile

Target Customers

Our customers typically may consist of small to medium sized high tech firms (<1000 employees). The largest portions of these firms are involved in the manufacturing industries.

Early Adopter Profile

Early adopters of Interneer include young engineers, consultants, and students. Firms in competitive markets are especially interested in gaining competitive advantages. This remains true for companies involved in cutting edge technologies in general. Those who are comfortable with the Internet and use it on a daily basis will find working online painless and even necessary. Also, mid-sized companies are more willing to take a risk on new products, whereas smaller companies are more reluctant and will want others to test first.

User Profile

Engineers

Engineers apply the theories and principles of science and mathematics to research and develop economical solutions to practical technical problems. Their work is the link between scientific discovery and commercial application.

Likes & Needs

Engineers need to continually update their knowledge base in order to maintain value to their employers. This can be achieved through formal education, research, work, interaction with others, etc. With a broad knowledge base, engineers are stepping up and taking on more responsibility, thus increasing productivity as well as furthering their career. Engineers require challenging and exciting work.

Mechanical Engineers: a Broad Skill Set

Mechanical engineering is the broadest engineering discipline, extending across many interdependent specialties. More and more, the boundaries between mechanical engineering and other disciplines are being blurred by the development of new technologies, new techniques, new knowledge, and new

lifestyles. The field is predominantly composed of white males and in fact has the smallest percentage of women of all engineering fields. In all countries, the mechanical engineering profession continues to draw its members mainly from traditional pools that are, in many cases, numerically dwindling.

Other Target Users

Interneer's product appeals to a variety of users beyond mechanical engineers. In particular, technicians who work in the same industries alongside engineers will find our product especially useful. This certainly isn't to say that these are the only potential additional users. Others such as scientists, purchasing agents, and anyone interested in or involved in engineering definitely have use of the services we provide.

Primary Market Research

Interneer continually mines knowledge and experience from practicing engineers to learn more about the state of the engineering profession. Focus groups composed of practicing engineers have provided a great deal of insight to engineering as well as validation of the Interneer platform. Additionally, a copy of a recent survey and tables of results are presented in the appendix. In this survey, twenty-five engineers with different education levels from various companies and engineering disciplines have participated in the survey thus far. Levels of experience of these engineers range from junior engineer to executive. The survey is designed to discover the wants and needs of today's working engineer.

One question determined how engineers utilize their time at work. As expected, most engineers spend a large portion of their time at work (41%) searching for information, performing calculations and procuring products and services. Interneer's goal is to simplify, document, and interconnect these activities by creating the most sophisticated engineering solution platform in the world.

Time Spent on Various Tasks by Engineers

Administration	13%
Searching for information	13%
Performing calculations	12%
Procuring products and services	16%
Other (meetings, etc.)	46%

Interneer will use the Internet to provide needed information and tools for the end-user. Therefore, the survey contains questions about online usage and types of connections available to engineers. Respondents spent anywhere from 2 to 30 hours per week online and averaged 18 hours. Furthermore, the majority of respondents claimed very high Internet access connection (DSL and Higher) at work.

Percentage of Respondents Using the Internet for Various Activities

Purchase research	52%
Competitor research	44%
Research new technology	68%
Email	88%

In a related question, participants are asked to give information about specific engineering resource web sites they frequent to find information. The majority could not name a specific site. This was expected for two reasons: first being the clear absence of such web sites, second being the lack of awareness on the part of engineers. Interneer solves this problem by creating an online engineering resource and by making sure through branding, advertising, and education that engineers are aware the site exists.

A major product offering from Interneer is the online log: a documentation tool for users and organizations to document their work. The survey contains a question about how often practicing engineers reference work they have done in the past. The responses thus far are overwhelmingly convincing: every engineer surveyed claimed to regularly reference work they have done in the past.

Interneer's product offering also includes access to information typically contained in engineering handbooks used by the profession today. Thus, a question on how often engineers reference engineering handbooks is included in the survey. The results are evenly distributed. The reason for the distribution is the varied function and responsibility level of the participants. Most engineers claimed to have frequent need for the handbooks, whereas most high level engineers or executives referenced the information only occasionally.

Number & Frequency of Respondents Use of Engineering Handbooks

Not often	7
Often	10
Very often	8

The last survey question asks how much engineers are willing to pay for engineering services that increase efficiency and productivity. Results show a monthly range per employee as low as $50 and as high as $2000. One major factor affecting the amount participants are willing to pay is their level of responsibility. Most engineers are willing to pay no more than $100 for Interneer, whereas leaders and the executives are willing to pay upwards of $2000 per month, provided certain tangible results are

accomplished with Interneer as the provider. This is encouraging considering those leaders and executives are far more likely to be the ones approving the purchase of an Interneer subscription.

Purchasing Agent

Purchaser Profile

The purchasing agent is typically a managerial entity consisting of engineering managers. However, in certain cases group leaders and project managers act in this capacity. Engineering managers of all types are normally technical engineers with management background. Purchasers are usually responsible for requesting funding for projects and department activities. Enhancing work efficiency, increasing productivity, and ensuring project completion are few of their assessment metrics. Interneer helps the purchaser meet goals by providing services that enhance efficiency, improve productivity, and expedite project delivery.

Interneer's Compelling Value

Almost every purchasing agent's business measurement is enhanced by Interneer's services. The argument for increased productivity is a simple one since it has a direct effect on the bottom line: cost and speed to market. Improving the engineer's productivity reduces budgetary constraints. In addition, knowledge management is a substantial side benefit. Interneer makes possible not only the generation of ideas and results, but also the documentation of the newly found knowledge. Much money gets wasted when knowledge in an organization remains tacit or departs with the employees. Although Interneer does not claim that all knowledge generated by its services is codified, however having all the work produced by the organization documented and organized, offers a tremendous advantage, and provides access to previously stranded investment.

Increasing productivity and knowledge management are not the only benefits and tools Interneer offers the purchasing agent. Centralized billing is another major advantage. Interneer provides all needed resources required to complete an engineering project. From vendor selection to part procurement, Interneer bills and centralizes every component of the project. The purchasing agent can of course setup a business account with Interneer and allow its engineers to use the account to acquire the needed services.

The Purchase Decision

The Decision Maker

The purchasing decision may rest with one or more individuals in an engineering firm and may require few to numerous approvals. The manager of a small firm may simply make the decision, whereas in large firms, the approval may require several steps of approval.

The Purchase Basis

The decision for purchasing will be based on an evaluation of the benefits and value from utilizing Interneer as well as an examination of the alternative products, such as competing Internet sites and traditional sources.

Customer Perks

Perks for reinforcing customer loyalty include discounts for subscriptions, engineering services, and extended contract deals as well as discounts for recommending Interneer to others.

Product Branding

Interneer will be branded as a 'cool' site by associating it with or entering into agreements with products that have an appealing image engineers can identify with. Interneer will also physically advertise on engineering-related projects that receive mass-media attention and also by distributing free Interneer promotional items.

Value Proposition

To the Engineer

Interneer offers many tangible benefits to the practicing engineer and hence to the engineering firm. Some of these are listed here.

- **Increases productivity** – all technical and manufacturing resources are a "point and click" away, desks do not need to be cluttered with technical books and references
- **Increased access speed** – allows engineers to perform searches and obtain results quicker than traditional sources and less extensive, competitive web sites
- **Reliability** – engineers will be assured of Interneer's reliability, and will not need to spend time double-checking calculations and data, as with conventional sources
- **Up-to-the-minute information** – the engineer will be assured that he/she is receiving state-of-the-art information and resources
- **Tracks resource usage** – online logging maintains a daily log of Interneer usage, allowing for better self-management
- **Expert help** – through Interneer's chat rooms and staff, expert help is always available

To the Procurement Agent

Interneer goes well beyond assisting in the efficiency of the engineering process, it adds compelling value to the procurement agent as well. Some benefits to procurement are listed here.

- **Simplified billing** – will have only one invoice to deal with from Interneer, rather than numerous invoices from multiple sources; will not have to spend time tracking invoices, writing checks
- **No catalogs** – no need to stock and distribute manufacturer's catalogs
- **Easy part ordering** – no need to do "guess work" on an engineer's request for equipment or parts

– the engineer will know exactly want they want

- **Procurement record** – Interneer will provide a record of all items purchased through its "Yellow Pages" and manufacturer lists that will aid the procurement agent in inventory procedures
- **Eliminate software** – Interneer replaces the need and hassle of purchasing numerous engineering software programs
- **Automatically upgraded** – Interneer continually upgrades, whereas with software and reference data, procurement agents have to deal with products that require incessant upgrades
- **No book / magazine subscriptions** – do not have to spend time maintaining subscriptions for engineering resource data and standards

To Management

Managers ultimately want to save money and develop superior products. Interneer makes it easy for them to justify the purchase of its product.

- **Saves money** – reduces project costs by minimizing engineering time and maximizing efficiency
- **One-time resource solution** – provides managers with an absolute solution to the technical requirements of their engineers
- **Instills confidence** – managers can be confident of the quality and integrity of engineering work that is being performed with the aid of Interneer
- **Saves on purchases** – by using Interneer's "Yellow Pages," managers can be assured they are receiving competitive pricing for their purchases
- **Maximizes markets** – Interneer's "Yellow Pages" will allow managers to tap into new markets and gain customers and increase company profits
- **Saves time** – minimizes management's involvement in approving engineering related purchases
- **Good buy** – Interneer will be an attractive investment – far cheaper than purchasing numerous software packages, site licenses, and technical reference books

Distribution Strategy

Gaining access to Interneer's product and services is as easy as typing in Interneer's URL, and entering company information. There is no need to stock bulky books and boxes filled with outdated software. Interneer is updated in real time, and it provides customers access any time and from anywhere. An engineer from California traveling on business in New York merely has to access the Internet, log on to their personal web page, and then they have access to the full complement of Interneer's services and any previous data they may have stored.

Although Interneer is available online and will aggressively advertise, it must still depend on traditional distribution strategies to get the word out. Interneer will employ resellers to go into the field and get new customers to log on and to sign up. In addition, potential customers will be able to go the reseller's site for a demonstration, and then be able to sign up then and there at the conclusion of

the demo. Interneer will also have stations available at major conferences for new customers to sign up on or to test the product.

Promotion

Market Penetration Strategy

To establish its brand and market presence, Interneer is launching a promotional program which includes advertising (online, journals, etc.), partnering with other companies that provide products and services to engineers, sponsoring events and competitions and giving free gifts marked with the Interneer Logo. Interneer will discount subscriptions for the first six months after Version 1 is launched. As the user base grows, Interneer will expand its diverse portfolio of products and service offerings.

Advertising

Interneer will use traditional and nontraditional media to establish its brand.

- **Endorsements** – obtain from recognized organizations such as ASME, NASA, SAE, AIAG, IEEE
- **Print ads** – place ads in trade journals and magazines, most notably Mechanical Engineering Magazine
- **Internet** – banners and links will be placed on the most popular engineering related web sites such as asme.org, manufacturing.net, and so-called vertical engineering portals such as icrank.com

Co-Promotion Partners

Interneer will partner with other companies that provide products and services to engineers. The goal is to continually add value to the site and provide engineers with an ever-increasing collection of resources.

- **Software companies** – form strategic partnerships with Solidworks, MatLab, ProEngineer, Autodesk to name a few
- **Publishing firms** – either license content from or partner with McGraw Hill, Industrial Press, Reed Elsevier, etc.
- **Equipment manufacturers** – solicit sponsorships from Hewlett Packard, Agilent, Palm, Dell, etc.
- **Resellers** – use reselling channels to distribute products and outsource help in exchange for commission

Trade Shows and Conferences

Participating in trade shows and conferences is an integral part of Interneer's promotional strategy. Interneer will automatically have a presence in many of the largest mechanical engineering related conferences by advertising in Mechanical Engineering Magazine. That is not to say that an ad in a magazine can replace a personal appearance. Interneer will attend major events. Some of these include Comdex, ASME Conference, Westech, Design Engineering and Manufacturing Solutions, and Manufacturing Week.

Service

Service is key to Interneer's success, and the Interneer Team is dedicated to developing and deploying the best customer service in the industry. This level of commitment will be achieved through 24-hour live phone help. This service will be unique in that the people answering the phones will not be temp agency hires, but rather the engineers who helped to create the site content in the first place. Interneer will rotate its engineering staff through the service department in order to ensure that each employee has first hand knowledge of customer needs and wants and feels personally connected to the customers. This level of interaction with Interneer's customers will also ensure that tools are constantly improved or added to address customer needs.

Service will also be outsourced to the VARs of Interneer's product. The reseller will act as a salesperson and help expert and will be trained by Interneer's engineering staff. Many subscriptions will be sold online without the need for the reseller, however these customers will still be initially routed to the resellers in their area. In order to incentivize the reseller, Interneer offers a commission, albeit smaller than if they sold it themselves, for every subscription sold in the reseller's region. The value added resellers will also provide important feedback from customers. Interneer will constantly improve and add new tools to address customer needs.

Upgrades

All of Interneer's products are offered online and therefore there is no need for sending periodic updates to customers. All products are updated from time to time directly on the site thus saving distribution costs for Interneer and saving the customers the hassle of updating software. Interneer plans to continuously innovate and add new services in order to provide our customers with the best possible solutions available. From time to time additional premium services will be made available to customers at an added cost.

Pricing

Interneer, Inc. obtains revenue from three distinct sources (the fee structure is provided in the Appendix),

- Customers (subscribers)
- Suppliers (vendors)
- Advertisers

Engineering Design Tools, Guidance, and Information

The beta and first generation of Interneer focus on creating a clear, focused value for engineers – tools, guidance, and information. This value can be quantified as a net savings of $ 15,200 per engineer.

Subscribers (engineers and their firms) pay either a quarterly fee of $ 1,000 / user or an annual fee of $ 4,000 / user. Firms purchasing 10 to 19 subscriptions will receive a 20% discount, and those purchasing 20 or more will get a 30% discount. This fee grants the user access to Interneer's design tools, online resource databases, vendor referral and material procurement, career placement, and consultants. Subscribers have the right to purchase additional for-fee services, such as software rental. CAD/CAM/FEA software will be rented hourly, daily, or weekly, as dictated by customer needs, and will be tier priced depending on the complexity/power of the software anywhere from $ 25 / hour to $ 30 / hour.

Vendor Referral Commissions

Suppliers are vendors of any kind – material, software, contractors, etc. Supplier links are located both in Interneer's searchable Yellow Pages and in targeted segments of the website. Interneer charges a commission for transactions occurring as a result of subscribers linking to vendors. Generic Yellow Pages click-through commissions are lower than targeted link click-through commissions and are determined on a case-by-case basis. In general, commodity low margin/price goods and services will generate 1-3% commissions and specialized high margin/price goods and services will generate 3-10% commissions. These values are based on current e-commerce transaction models. In addition to commission revenue, suppliers also pay for premium search placement.

Operations

Billing and Accounts Receivable

Interneer will maximize its cash position through an incentive billing structure and proactive collection of accounts receivable.

The Subscription Customer

Customers are billed monthly based on a subscription contract, although a 5% discount will be offered to those companies that pay for the full year's subscription in advance. Billing is not done in advance of the next billing date and the invoice date is the renewal date. Payments methods will offer incentives for using electronic checks (a 1.5% discount which reflects a portion of Interneer's savings in accounting costs) and 1.5% savings for payment within 30 days. Interneer makes payment as easy as possible for its customers in order to reduce bad debt expenses and improve its cash position. Major credit cards, company checks, or money orders are also accepted. Payment information can be updated via the Internet or by calling Interneer's customer service line, or by e-mail.

Billing statements will be generated each business day for the previous day's renewal and on the generation date a notification will be sent by e-mail to subscription customers 3 to 4 days before the next billing cycle. The bill will be held open for this time to process any changes requested by the

customer and will then be closed. The account billing frequency and mode of payment can be changed on the website or by replying to the automatic e-mail notification. Subscription rates will implicitly internalize the fees for check authorization services (provided by Telecheck Service and Equifax) and the handling fee that financial institutions require for reimbursing credit card charges. The cost for these services will average out over time to be 3% for each transaction.

The Advertisers:

Interneer will also maximize cash on hand in collecting fees form Web advertisers. Generally, the ads will be paid for on a CPM (cost per thousand impressions) basis – for every thousand times a viewer loads the Web page containing the ad banner, the advertiser will pay Interneer a fee. Because of the high-value, high concentration market of engineers Interneer delivers, this CPM fee rate will be competitive with such advertising leaders as Yahoo!, AOL, and NetZero, which is $7 to $10. This fee is a competitive offering for the advertiser as compared to CPM rates for specialized Web sites such as Microsoft Carpoint where the CPM rate is $47.

Paying Suppliers

Interneer will maximize available cash by negotiating lines of credit with suppliers. Invoices will be paid at the end of the allowable grace period, after they have been received and verified. Interneer will take advantage of cost-saving incentives when invoices offer a discount when bills are paid on-time (for example: a 3% savings for payment within 30 days).

Aside from the minor use of suppliers for administrative needs, Interneer's main suppliers will include those that provide information services (such as technical data or engineering standards). Interneer will pay suppliers through an electronic accounting and check transfer system to lower accounting and transaction costs.

Human Resource Management

Interneer operates with a flat, decentralized, team-based management structure, to encourage initiative and foster speed. The company's main units are: Database/Technical Services, Business Development, Marketing and Promotion, Finance, Engineering Services, and Administration (Fiscal, Human Resources, etc.). Teams will be fluid, change by project, and be crosscutting. Each unit will have it's own management structure, with its own director.

Warranties & Returns

Any downtime of Interneer's services due to Interneer's actions will result in a customer's account being credited accordingly. In all customer contracts, Interneer is explicitly held harmless for losses

associated with disruption or downtime of Interneer.

Interneer will maintain a back-up/disaster recovery system in case of such situations as a server crash. This will back up all work every 10 seconds using software that identifies and saves only incremental changes in the client's work – a protocol that requires limited bandwidth. However, the customer's data is his/her responsibility and Interneer strongly encourages the use of the built-in, back-up utilities to enable quick data recovery for the customer and avoid the loss of data.

Monitoring & Budget Control

Interneer will maintain strict financial controls to respond rapidly to issues and opportunities as they arise, and to provide critical information to management. This will be accomplished by structuring the company with profit centers by division, starting in the second year of operation. (During the first year, the firm will be small, employees will see their direct influence on the bottom line, and transaction efficiency will be paramount.) Each section will have its own accounting system, where all external and internal transactions will be recorded in real time. All sectional records will be sent to employees and managers, and consolidated into a single accounting system. Using this method of financial control, Interneer will be able to closely monitor progress towards its financial objectives, avoid financial crises, and identify opportunities for improvement in real-time. Interneer will also be able to identify and reward teams for their superior performance in this way.

Expansion Strategy

Interneer will start by focusing on the initial stages of the product life cycle

Throughout the last decade, companies have spent a tremendous amount of resources to implement ERP systems in an effort to standardize and link multiple departments and suppliers within the Supply Chain. As a result of these complex and expensive systems, some companies were able to develop more efficient manufacturing and logistics processes as well as realize substantial cost savings. However, by focusing on the back end of the product life cycle, most of the costs of bringing a product to market have already been established. It has been estimated that 80% of the total costs of the entire product life cycle are determined in the product development stages. By focusing on the early stages, Interneer will deliver tremendous value to manufacturing and engineering firms by providing a complete product development solution that is affordable and easy to use. Interneer will help companies reduce costs, bureaucracy, and development time by offering an integrated suite of tools to improve efficiency and communications over the Internet

Interneer will provide a suite of value-added products and services

Once launched, Interneer will provide a suite of value-added products and services to mechanical engineering firms, concentrating on mechanical systems design and low-tech manufacturing. These products and services include: databases containing the most widely used engineering data, equations, industry reports/articles, and government regulations (retrieved via an intelligent and interactive search

engine); interactive problem solving tools and models; procurement and outsourcing resources; CAD / CAM / FEA server run applications; and career/educational resources. Once the systems and processes are established and successfully meets the needs of this target market, Interneer will leverage it's best practices, resources, and partnerships to expand its products and services to other areas of mechanical engineering ranging from power systems to acoustics/vibrations, spanning numerous industries.

Interneer will establish a business model for mechanical engineering then replicate for other disciplines

Interneer will use mechanical engineering firms as the test market to establish the business model and proof of concept. Once Interneer has acquired the necessary systems and processes, partnerships, resources, brand recognition, and client base, it will duplicate these product and service offerings to other engineering disciplines. By leveraging its expertise and proven product development model, Interneer can quickly replicate similar design solutions for civil engineering and aerospace firms. These two fields were chosen because of similarities in concepts and applications. This expansion strategy will continue in a similar fashion, extending product and service offerings into electrical engineering, chemical engineering, etc. As Interneer executes its expansion strategy, it will provide additional value to its clients as well as gain operational efficiencies at an exponential pace due to economies of scale and network externalities. After achieving critical mass, Interneer will establish itself as the premiere engineering portal, providing additional services to the engineering community that extends beyond the design process.

Interneer will provide value throughout the supply chain

As the provider of comprehensive design solutions, Interneer is strategically positioned to provide value throughout the supply chain, helping companies reduce the cost and time of bringing products to market. By integrating marketing, manufacturing, customer service/support, and all levels of suppliers into the design process, Interneer offers a platform that enables clients to implement mass customization and concurrent engineering techniques. By providing design engineers with direct input from marketing, they can design products based on real time market demand. Through information sharing among engineers within the firm and their suppliers, Interneer enables clients to design parts concurrently and interactively. Going beyond just design activities, Interneer incorporates manufacturing to simplify and improve the transition from product development to manufacturing. Incorporating manufacturing and supplier input into the process, Interneer enables engineers to design products using postponement and design for manufacturability concepts. In addition to manufacturing, Interneer will link customer service/support with design engineering. This two-way communication will provide post sale support with information to make their jobs easier as well as establish a feedback loop for continuously improving the product development process.

The Interneer software also provides the following functionality:

- Newsgroups in users' areas of expertise – allows for interaction amongst others in users' own communities and also throughout all communities – sometimes hosted by industry experts
- A directory of manufacturers/vendors with Icon information describing what the manufacturer website contains
- A directory of consultants/companies providing engineering services categorized and searchable by keywords
- The search also allows semantic searches
- Online job posting forms – ability to bid for services
- Online resumes – searchable
- Online contract request and bidding – ability to post contract requests online, timed and at a minimum initial bidding price – also ability to search for bids by engineering field or browse by category and bid online
- Mentor program for young engineers – make available screened mentors and provide them with questions from querying engineers – search mentors by categories and view experience
- Built-in FDA design control
- CE Mark certification guide
- Design for Manufacturing wizard
- CAD drawing analyzer for Manufacturability – Identify square inside edges, non-standard drill sizes, etc.
- PDA downloads
    - Screw selector
    - CAD viewer
    - Assembly drawings
    - Bill of materials
- Clickable-BOM to drill into design process for each part
- Engineering trivia
- Student competitions
- Teacher homepages for their students and homeworks online
- Connecting all the parts of an assembly together along with functional constraints for each so that if a change is made for one, it is propagated across the others and you can see the errors generated
- Studying behaviors of engineers and users on Interneer and gaining insights on how they work and conduct design to better serve them, in other words, data-mining
- Vendor catalog annotations and library of those annotations
- Design failure database – i.e., analysis of high-profile design flaws, and ways to avoid similar mistakes in the future
- Environmental impact analyzer – similar to the cost estimation function, but with environmental costs
- Lifecycle cost estimator – cost of design over time
- Standards alert – let's you know when a design or model does not comply with standards

parameters

- Document storage/linking – attach other types of documents to models
- ISO 9000 automatic tracking
- Project management
- Ability for managers to track their employee's use of and interaction with software
- Ability for managers to generate reports on how much knowledge their employees enter into the database and how useful the information is (measured by how many times others visit the information and the others' comments on it) – also more macro tracking of current state of company's knowledge resources
- Ability for companies to track their knowledge resources and to report areas of deficiency – automatic generation of new employee leads based on deficiencies – comparison to other companies competencies in similar industries
- Ability for users to submit information or processes to the entire Interneer community, and if accepted, possibility of including branding information near the submission for viewing by all Interneer users – thus ensuring organic/viral growth
- Ability to interact directly with other engineering software applications and to directly insert specified variables from Interneer's software into the additional software – for example automatic update of parameters in a CAD file with a simple click of a button on the Interneer site based on user's submitted values.

Content Development and Implementation

1. INTRODUCTION

Functional development and implementation for populating the Phenom software with engineering content are described in the following sections, including:

- Content Selection Criteria
- Content Structure
- Content Sources
- Risks

2. CONTENT

2.1 Content Selection Criteria

The overall strategy for content selection is an initial narrow focus on key areas with the focus expanding as our customer base, market and experience increase. Content selection is separated into three (3) phases. The three (3) phases coincide with software version releases, i.e. beta releases, version 1.0 and 1.5 releases and all future releases. This methodology for content selection has been chosen due to increasing user and task analysis information, copyright licensing issues and schedule limitations. Each phase is discussed below:

2.1.1 Phase 1

Phase 1 release(s) has sufficient content to sufficiently test usability. Content is broad enough to demonstrate the utility of the software and deep enough to have some limited use in an

engineering environment. Content selection for phase 1 is based on the following:

In-house expertise and "best guess" for first cut of content.
Preliminary user and task analysis results, i.e. surveys, interviews and focus groups.
Discussions with beta partners.
Copyright licensing of selected sources.
Content input schedule and resource limitations.

2.1.2 Phase 2

Augmented content that better reflects the needs of our beta partners, launch partners and users. Content is broad enough to cover primary markets and deep enough to be used on a daily basis in an engineering environment. Content selection for phase 2 is based on the following:

Beta site users input.
Continuing user and task analysis results.
Copyright licensing of selected sources.
Content input schedule and resource limitations

2.1.3 Phase 3 – Future Releases

Continued content expansion based on the evolving needs of users is the primary focus of Phase 3. Content is broad enough to cover primary and secondary markets and deep enough to provide comprehensive capabilities to the engineering community. Content selection for phase 3 is based on the following:

Customer/Beta site user input.
New and evolving markets.
New and evolving content, i.e. new books, technical papers, expert/author input, etc.
Copyright licensing of selected sources.

2.2 Content Sources

Content is obtained from several different sources, the most obvious is from technical books. Other sources are technical papers and journals, trade publications, vendors and original work. When used, every source is referenced and in particular the type of source, i.e. textbook, vendor data, trade journals, etc. This gives users the needed information to determine the level of caution required when using the selected information, e.g. an equation from a research paper should be used with greater caution than an equation from an established book.

2.3 Content Structure

The content is structured at a top level by modules, within each module there are classes, within each class there are sub-classes and finally equations, see Figure 4.

2.3.1 Modules

Currently twelve (12) Modules have been identified and proposed, this is referred to as the breadth of the content in section 2.1. Each module represents an area of engineering, i.e. Machine Design, Material Properties, Stress and Deflection, Heat Transfer, etc. Within each module specific subjects will be indexed. For example, under the machine design module specific subjects can be

Bolts, Screws and Fasteners, Pressure Vessels, Flanges & Brackets, etc. See Table 1.

2.3.2 Classes

Solution classes have been identified within each Module, this is referred to as the depth of the content in section 2.1. For example, under the Stress and Deflection module subject areas for Cantilever Beams, Simply Supported Beams may exist. See Table 1.

2.3.3 Cases

Within each class, specific case may be necessary. For example under Cantilever Beam Subject Areas a category for Load Types may exist.

2.3.4 Content

Content is defined as any data, mathematical or language. This can expanded to include graphs, tables, pictures and drawings.

Table 1. Module and Problem Class

Module	Problem Class
Machine Design	- Gaskets & seals - Bolts, screws & fasteners - Welded, brazed & soldered joints - Pressure vessels - Curved members - Gears, bearings, springs & shafts - Flexible elements
Stress & Deflection	- Bending - Buckling - Fatigue & fracture mechanics - Properties of cross sections - Non-linear problems - Dynamic & thermal effects - Advanced topics - Failure criteria
Material Properties	- Metals - Non-metals - Plastics - Composites - High temperature materials - Cryogenic materials - Out gassing of materials - Thermo-physical properties of fluids & gasses
Shock & Vibration	- Natural frequency - Mode shape - Shock & impact - Response to inputs - Mechanical impedance - Isolators

	- Random vibration
Heat Transfer	- Conduction - Convection - Radiation - Advanced topics
Fluid Mechanics	- Pipe & tube flow - Open channel flow - Turbulent flow - Flow over fins - Advanced topics
Applied Mechanics	- Friction - Velocity & acceleration - Inertia & momentum - Energy, power & work - Fluid at rest - Dynamics of rotation - Balance
Manufacturing	- Design for manufacturing - Design for assembly - Taguchi methods/SPC/DOE
Standards & Specifications	- Military/aerospace - Commercial - Test specifications - Design standards
Design Assurance & validation	- Design requirements - Drawing control - Specification/configuration control - Design methods, analysis and integration - Design reviews - Reliability and quality
Failure analysis	- Failure of materials - Failure analysis methodology
Rules of Thumb	- By industry - By product
Custom Modules	- Customer in-house design manuals & standards

2.4 Content Input Process and Quality Assurance

The content input process is a non-trivial matter and is identified as the 3rd greatest risk to content implementation success. The process blocks are explained below with the entire process flow shown in Figure 5.

Operation 1: Content Requirements Request

The content requirements request can come from any area of the organization. It is simply a request for new content, i.e. equations, references, material properties, etc.

Operation 2: Research Current Content Library

After a need has been identified the responsible engineer searches the current in-house library. This library will consist of sources that have been licensed or where permission has been given for usage.

Operation 3: Gate -

If the content exists within the in-house content library the sequence flows to the next operation. If the content does not exist then an alternative resource is researched and identified and a trade-off analysis is performed. The trade-off analysis takes into consideration the source of the content request and the overall effect on the product. In addition, the time, complexity and cost of obtaining a license agreement are considered.

Operation 4: Content Input Form

At this operation the responsible engineer fills in a form that indicates the content, reference(s), worked examples and any caveats, rules or limitations associated with the content. The information contained on the Content Input Form is the body behind the on-line content, see Appendix A.

Operation 5: Gate – New Content Review and Sign-off

Results from the trade-off analysis and the content input form are reviewed and approved or rejected at this operation. The reviewers are composed of representatives from engineering, software, marketing and operations. Three (3) outcomes are possible; accept, redo or cancel. In each case the reason for the decision are made clear and recorded on the Content Input Form.

Operation 6: New Content Input

The actual content is input into electronic format at this operation. If the content is language or tables this operation may be outsourced. A software input program is used to facilitate input speed and accuracy.

Operation 7: Gate – Level 1 Quality Check

This operation edits content for accuracy and completeness. In the case of an equation, this is the first time it is "exercised" utilizing worked examples provided on the Content Input Form. If it passes the level 1 check it will flow to the level 2 check. If it does not pass the level 1 check, it will be corrected and re-input.

Operation 8: Gate – Level 2 Quality Check

This is a system level final functional check to ensure that new content operates with all other parts of the software and is fully functional.

Operation 9: Gate – Final Review and Sign-off

This operation is the final review prior to release to software integration. This review takes into consideration data and results from all previous gates. The reviewers are composed of representatives from engineering and software. The three (3) possible outcomes are; redo, cancel or pass. If the new content passes this operation it is released to software integration for release. In each case the reason for the decision is made clear and recorded on the Content Input Form.

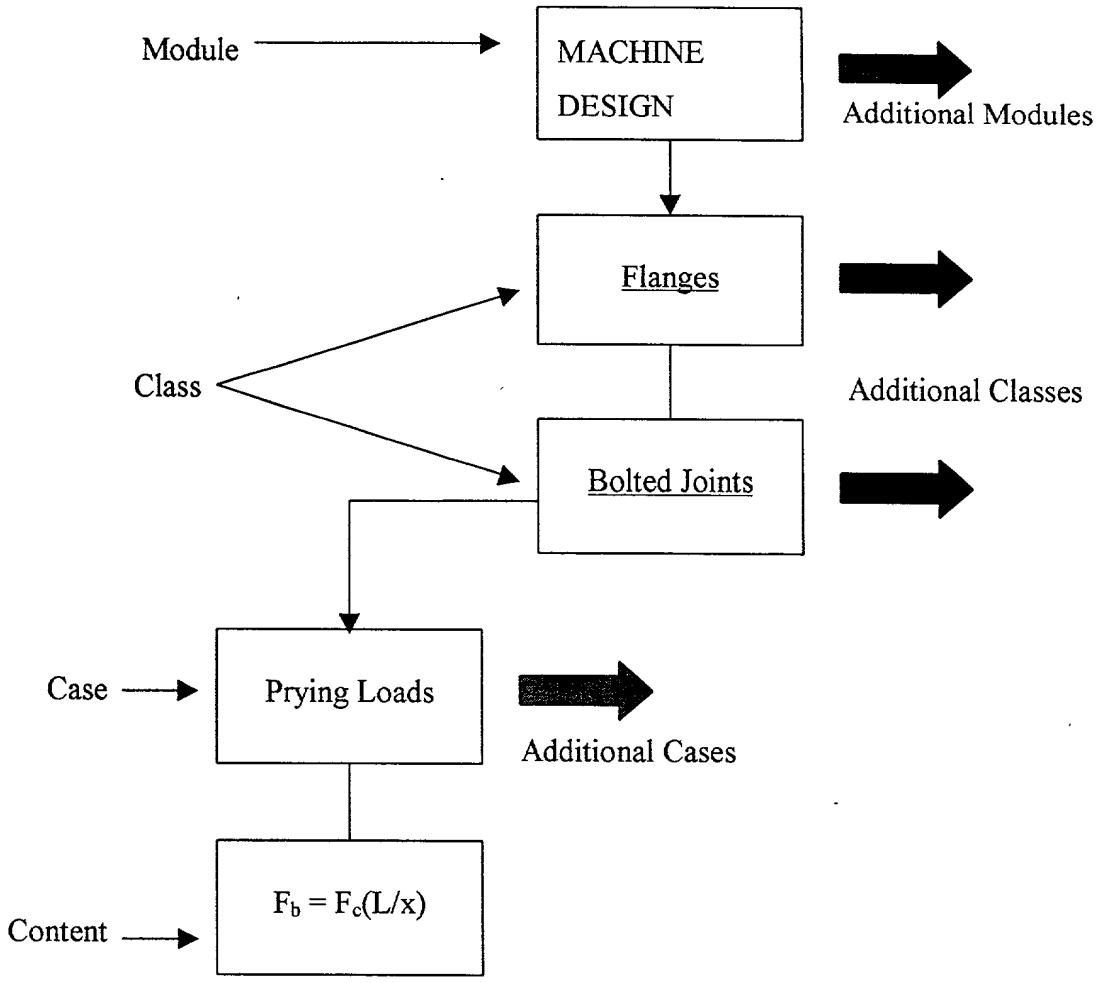


Figure 4. Content Structure

3. RESOURCE REQUIREMENTS

3.1 Tools

As mentioned in section 2.4, Operation 6 – New Content Input, software that facilitates the input process is required. This software will reduce the level of personnel required for fast and accurate input. This is an in-house project with the resultant software an integral part of the "key competence" of Interneer.

3.2 Staffing

3.2.1 Responsibilities and Requirements

Principal Engineer, *module name* – This position is responsible for the content, editing, research

and upkeep of each module. They interface with all levels of the company as well as customers. The person in this position *must keep current with developments within their field of expertise*. One (1) or more principal engineers are assigned to each module, depending on the module content depth. This is a senior level engineering position with at least ten (10) years of industry experience, they should be considered an expert in their field.

Engineering Editor – This position is responsible for the input of content. They interface with all levels of the company and may have some customer interface. This position is not assigned to a specific module or principal engineer, but is a "rover" and is allocated where resources are needed. This is a junior to middle engineering position with some industry experience, they must be detailed oriented and flexible.

Technical Editor – This is an itinerant position composed of primarily student engineers. They work under the supervision of the technical copywriters and/or the technical editors. They are of at least junior level standing in one (1) of the engineering disciplines, mathematics, physics or other comparable majors.

4. RISKS

4.1 Usability

Usability is classified as a risk because if the content is not usable implementation will not be successful. The usability will depend greatly on our recruitment and handling of beta partners as well as the user and task analysis efforts. In addition, our interpretation of this data will be crucial to the proper content mix.

4.2 Content Input

Due to the large amount of information that needs to be put into electronic format, content input is classified as a risk. Content input is a complete plan in and of itself, it will require manpower estimates, process and procedures, software suite specifically for content input and quality procedures..

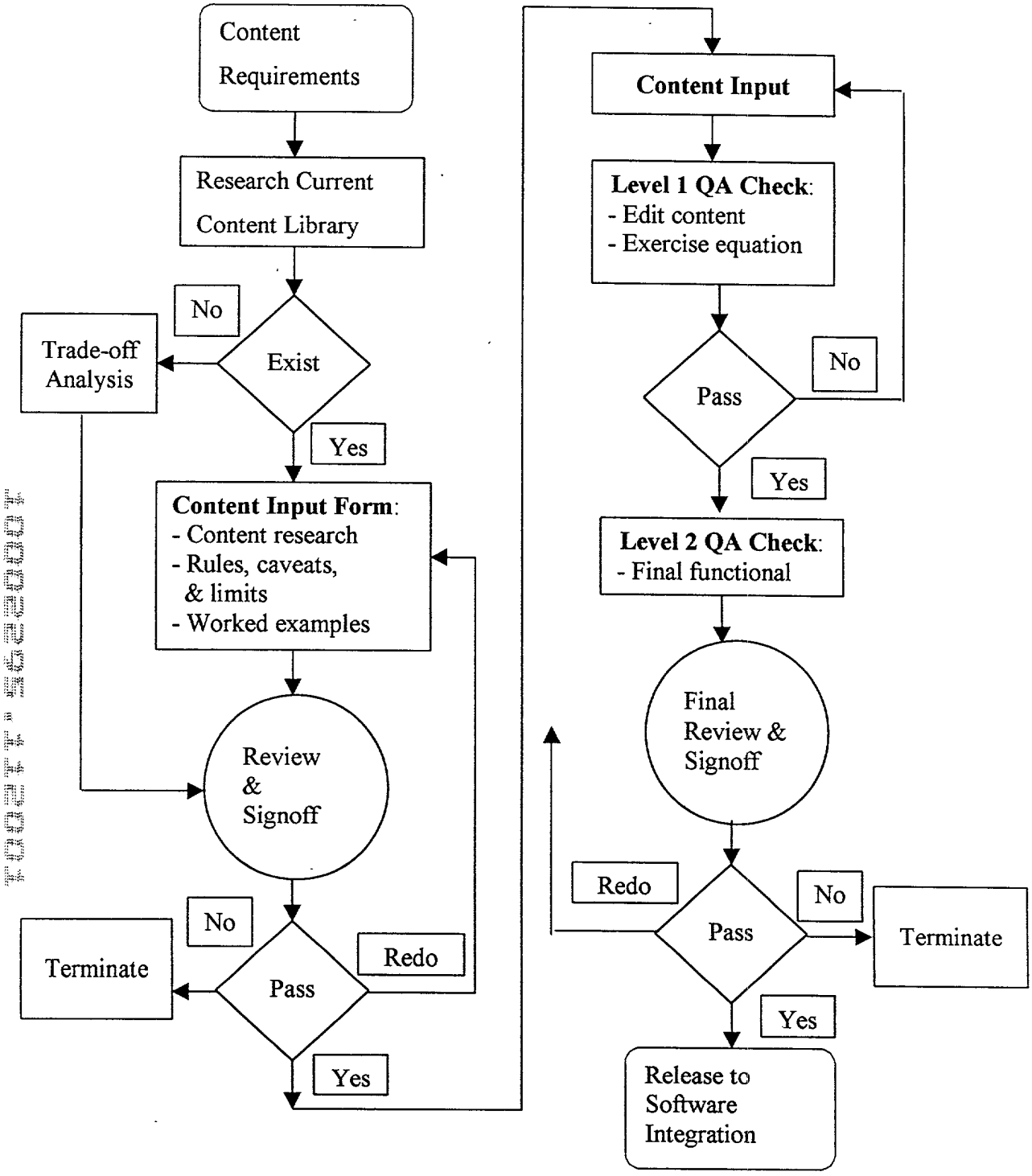


Figure 5. Content Input Process Flow

Appendix A

Content Input Form

Document Number XXXXXX

Revision XX

PRINCIPAL ENGINEER: *COGNIZANT ENGINEER.*	**DATE:**
REQUESTOR: CAN BE ANY SOURCE, INTERNAL OR CUSTOMER.	**DATE: REQUEST DATE**
Requirement(s): *What is required to add information, solve a problem including features and end results.*	
Source(s): *Content source or sources including: source title, edition or version, year, author(s), page and/or equation number, publisher and source type.*	
Module: **Case:** **Class:**	
Layout: *Sketch of layout as it will appear on screen including free body diagram, content explanation, content, limitation, charts, tables, etc.*	
Content: *Content as it will appear on screen. This will be input verbatim.*	
Content Explanation: *Explanation of content as it will appear on screen. This will be input word for word.*	
Content Limitations: *Limitations of content as it will appear on screen. This will be input word for word.*	
Content Links/Dependencies: *Links and dependencies associated with the content.*	
WORKED EXAMPLES: ***WORKED EXAMPLES FOR*** **QUALITY CONTROL OF PRODUCT.**	

Signoffs

Name	Date	Role

APPENDIX C

I. Business Methods

A. Processes (e.g. Turning workflows into products)

1. ASP

a) The software is accessible to users over the Internet. Users will pay a yearly or less subscription fee to access it and to have access to various content modules for an additional premium. Also, simulations can be run on the site through the workflow and access to third party software is available at additional cost.

b) Users will also have the option to save the data they generate locally on their systems or on Interneer's servers.

2. Intranet/Enterprise Software

a) Customers can also choose to have the software installed on their internal software for a one time license fee and yearly maintenance fee. The installations will likely include customization and integration with other software at the customer's location. All data generated from software use will then reside on customer servers.

II. Technology

A. Functionality

1. System Administration:

a) Users can create accounts, assign privileges and sharing rights to accounts, organize methods, information, data etc. into folders, track usage of files and workflows, ensure a workflow process is followed for each file or

method and that the appropriate checks are done, and the right approvals are assigned.

b) Administrators are also able to track what types of methods used by what types of users. Create updates to the expert directory, run data mining tests and allow others to run those same tests.

c) Administrators will also be able to publish to the whole user base content and will be able to approve content from others to publish to everyone else. They can assign usage rights to third party software according to users or groups etc. Superuser accounts may also be provided and be allowed more privileges than typical users but less than administrators, such as assign privileges and function within groups (i.e. they function as group administrators but have no control outside the group).

d) Administrators can also generate reports about the work and usage. They also would manage and set overall system parameters like user interfaces, options, settings, including adding system methods, creating the initial expert directory, adding suppliers manually to the database etc.

2. Workflow Creation:

a) Users can build their own methods; link them to the software they use (e.g. CAD, FEA etc.), incorporate interactive equations, images, figures, documents.

b) Users can specify rules to govern the navigation of the methods, the equation variable values, the decisions and steps to take etc. as they build the processes.

c) Users will be able to see and use an interactive map that will show the overall method steps, the links and relationships between the steps and the step they are on. They would also use the map for navigation as they build the methods.

d) The users can publish the methods, or steps in a method, to their group members or they can request that their methods be published to everyone and can submit to administrator or necessary user for review.

e) Users can organize the methods/workflows under different project headers; they can choose to generate reports during the process for reviews.

f) Project managers can organize the methods and assign them to project users to use and to track progress on methods hence projects. They can also provide access to the different methods to more than just group members, but also suppliers and customers.

g) Users can drag and drop different methods or steps in methods into each other. Also, they can drag, move and rearrange the different steps in the methods using the map.

h) Users can setup their methods to loop back on themselves with different parameters so they can run like programming logic.

i) Methods can be created using voice instructions. Video attachments can also be used.

j) Users can specify integration with specific unit dimensions for different parameters and tables (e.g. materials, constants etc.) at each step or process.

k) Steps in a method can be added without linking them so as to generate simply a list of steps with no relationships or links defined. The user can then select each step and specify what parameters to include in it, what to link it to, what files to attach etc. in no specific order. This provides flexibility and ease of use for the method creation process.

3. Interactive Methods Capability

a) Users can run methods to generate result sets. They can iterate many times, save results, print them out, generate formatted reports and share with others their work using email or by online collaboration.

b) Users can also save their work in the online journal, which is described below.

c) Based on how the methods are constructed, users can interact seamlessly (e.g. Matlab) with third party software or by directly being directed to the actual software. Also, users would be able to run the third party software using Interneer's platform.

d) Users can copy any method for future editing. By copying a method, the user essentially creates a new one for them.

e) The methods are organized to be intuitive and easy to use by placing menu items that allow the user to quickly navigate around the page and to different steps.

f) Methods can be run on their own and generate results just like programs do. Users can specify variable value ranges when running these simulations. This allows for quick iterations even if users are not available.

g) Methods can generate voice instructions for those who prefer (e.g. assembly instructions, cooking instructions etc.) with feedback from user accepted also in voice commands.

h) Methods can also run at a pre-specified speed rate, step by step, and show videos as well.

i) User can select from predefined parameter lists e.g. units, material properties etc. already integrated into the method.

4. Annotation

a) While running a method, the user can choose to annotate a specific page, or element of a page (e.g. equation) and save it so that it is referencable by other users or by her in the future.

b) The annotation could be made accessible to the public, to the group members only or for personal use only.

c) The annotations are searchable by many parameters including date, username, topic etc.

d) The annotations are also editable by group managers, administrators and/or creators depending on the pre-selected settings.

5. Journaling

a) EJournal

(1) Snapshots

(a) User can save a snapshot of the page they are working on with all the results from that page being saved. These snapshots can be saved and organized in different project folders.

(b) All values of variables from equations, plots, figures etc. are saved.

(c) User can also then search their eJournal entries by different parameters including date and content to find the specific entry. By clicking on the entry, they are able to see what they had originally saved.

(d) If there have been updates to the page, the user is informed that the page is no longer current with the option to recreate with new page.

(e) EJournal entries can also be emailed and shared.

(2) Session Recording

(a) Users or administrators can specify settings so that everything the user does on the site, including running or creating methods, is saved in a user session.

(b) These sessions are searchable by various parameters including date and content.

(c) They can be emailed and shared with others.

(d) The expiration date can be set and specified.

(e) In addition, a user can actively specify that they want to start recording a specific session and store and organize that session in a project folder in the eJournal. These types of sessions can also be searched and emailed.

(f) Session recording can be used later to track usage, modifications to methods, history of changes and result sets.

(g) Users can save their workflows at any point, at which time the software will save all the values of variables, notes, images etc. worked on until that point in the workflow so that the users can come back to it later to complete.

b) Report Generation

(1) Formatted reports can be generated from the eJournal for various uses. Reports can be printed and/or saved. The user will be able to select from a previously created set of formats and they are able to create their own custom ones.

6. Search

a) User is able to search and browse by entering keywords, phrases or questions into a search box. The search then generates a list of results which are organized based on the taxonomy organization and displayed to the user in a manner which allows them to browse and navigate to the desired result, rather than have a long list of results on the screen to look at.

b) The user can also quickly change their search criteria by simply expanding under a specific tree branch to expand the search categories there, hence enabling them to browse in the right location after the initial search is conducted.

7. Taxonomy

a) The user is able to use a taxonomy builder tool to organize all the methods and attach files, figures and other data. The parent/child organization is enhanced with keyword entry at each step and descriptions entered which are then used for effective searching of the methods.

b) The taxonomy builder allows the creation of a network of nodes (parents, children, targets), which can be interconnected, looping on itself and with no initial starting point.

c) A custom taxonomy can be built for each customer or subject area. They can be searched separately or simultaneously.

8. Data mining

a) A separate function allows the ability to sift through all the eJournal entries and sessions recorded to determine usage patterns, to generate recommendations on designs, to infer user expertise by reviewing content etc.

b) This functionality would be accessible to administrators to view all users, to group users to analyze group user data and to personal user accounts to analyze their own activities.

9. Sales Tools

a) Create modules that help sales people generate quotes fast, recommend solutions to customers and to provide quick feedback to customers without having to go to engineer.

10. Integration

a) Architecture modularity and XML standardization allow for quick expansion of functionality and for easier integration to third party software. This integration is achieved by creating custom components that interact between the third party software and the Interneer system. The integration

components do not affect the rest of the program.

b) Integration is possible by having the user engage the third party from within or starting from Interneer.

c) Integration is also possible by having the third party software engage Interneer. For example, a user can select a part in an assembly drawing in a CAD package, and the CAD package can query Interneer directly or through a PDM system to discover the process or eJournal entry the user used to design this part.

d) This integration can also provide information about the suppliers used, the equations run, and the users involved in the design.

11. Global Parameters

a) A project manager can setup a workflow method, which contains all the critical parameters for a project, and provide the constraints for each one and how they are linked to each other and how they affect the different users.

b) When a project member wants to make a change to a specific parameter, rather than hold a meeting with all the different project members to evaluate who gets affected and by how much, they can simply modify the parameters in the global parameter workflow and run it.

c) When run, the global parameter workflow will then generate a list of all the users affected

by the change and additional information about lead time etc., which will enable the project manager to make a quick decision without holding a group meeting.

d) Also, this workflow will hold all the key parameters for others to reference throughout the project and when updated, it will notify all the members of the change.

12. Historical Data

a) The user has access to historical data from previous projects either entered manually or automatically using the eJournal functionality.

b) The historical data will be integrated into the software so that when a user is specifying values or making decisions, a list of historical choices or values are available to them to use or select as needed.

APPENDIX D

Interneer will provide access to essential mechanical engineering information and guidelines and will facilitate the capture and deployment of our customers' internally generated engineering knowledge, organization-wide. Through a unique combination of online knowledge, workflow, and community management, Interneer will dramatically increase both efficiency and effectiveness. As a result, the process of mechanical engineering will become far more cost effective, while simultaneously benefiting from an overall increase in quality.

Interneer is delivering an online virtual workspace for engineers to:

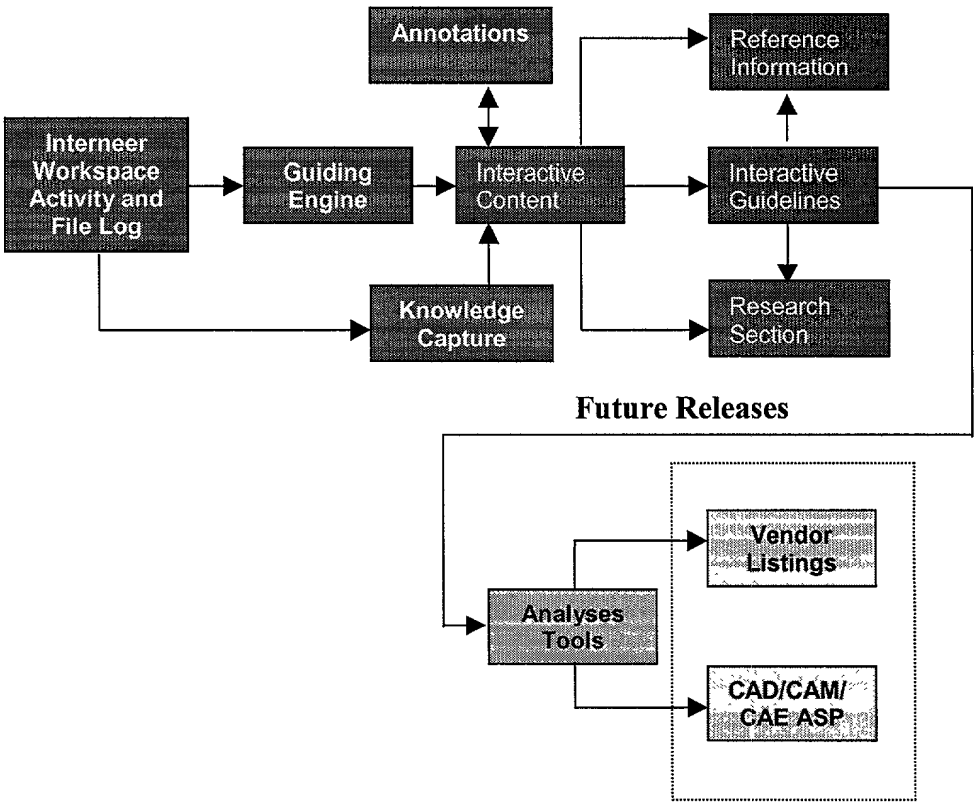
- Search for and interact with design process information and data quickly and efficiently.
- Solve technical problems online following established guidelines and rules of thumb.
- Capture, codify and leverage information, knowledge and processes.

Subscription paying engineers are provided access to the most widely used engineering information, equations and data (retrieved via Interneer's proprietary intelligent and interactive search engine), problem solving tools, and a workflow system creation and deployment tool. Interneer will also provide PDA accessibility, collaboration and will expand into procurement and outsourcing resources, CAD / CAM / FEA server run applications, and educational resources. Based on customer feedback, additional features will be added through development, licensing and partnerships.

Work Space Navigation

Figure D-1 shows the Interneer Process Diagram. The user logs in to their personalized engineering workspace where they have access to their account information, server files, activity log and all the available tools. Once there, users can deploy the guiding engine to search and browse for the key information they seek, from references to guidelines. The user can also choose to create annotations or capture a workflow. As the engineer works through an engineering workflow, they are able to interact with the content, reference necessary information and conduct analyses in real time. In future releases, Interneer will integrate with vendor databases to provide real time feedback on specified part availability. Also access to tools such as CAD, CAM and CAE will be provided on a fee for use basis. Interneer's software offering is described in detail in the following subsections.

Figure D-1.



Guiding Search/Browse Engine

Interneer's guiding technology is based on proprietary software that combines the power of keyword searching with the flexibility of browsing. This combined search method allows engineers to reach relevant results more quickly. Interneer dynamically generates browse-able categories based on the search information provided by the user. Engineers are thus able to enter keywords that will be interpreted by the software and be guided to the best solution via multiple layers of dropdown lists. The category list is limited to those relating to the keywords. This allows users to understand how the search is locating the target information needed, so that at any time during the browsing process, the

engineer can quickly change paths (if they realize that they mistook the search definition).

Engineers are able to search Interneer-created and user-submitted, approved guidelines. They can also search through their activity log. The search/browse engine is one of the fundamental ways Interneer will save engineers time, guiding them quickly and efficiently to the knowledge they seek.

The software includes taxonomy searching features. Each taxonomy consists of taxonomy categories and targets, with links between categories and categories, or between categories and targets, which indicate parent/child relationships in the hierarchy. In addition, a target may be associated with zero or more keywords. Multiple taxonomies are supported.

Thus, the taxonomy structure is stored in five database tables:

- taxonomy
- taxonomyCategory
- taxonomyTarget
- taxonomyTargetKeyword
- taxonomyLink

To search a taxonomy, a user enters a one or more keywords and presses "Submit"

The software performs the following search algorithm:

Middleware:

- Retrieve from the database all taxonomy targets associated with the given keywords.
- For each taxonomy target:
    - Call a function to process all parent categories.
    - Within this function:
        - Retrieve from the database all links to parent categories of this target.
        - For each parent link:
            - Call this function recursively to process all parent categories of this category (i.e., at the next higher level).
            - Set link type to indicate a taxonomy root if function result indicates no parents for this category.
            - Store all attributes of this link in a parameters collection.
            - Nest this parameters collection within another parameters collection containing all processed links.
        - Next parent link
    - End function
- Next taxonomy target
- For each processed link in the nested parameters collection generated above
    - Retrieve from the database the name and type of the child category, if the child is a category, or retrieve the child target reference (the thing pointed to by the target -- i.e., process step) if the child is a target.
    - Store this information in memory in an array of link data, with the attributes of child and parent nodes also stored in each link. (Some data stored redundantly for efficiency.)
- Next processed link
- Loop through link data array to convert to XML menu

structure

- Find a link whose parent is a root category not previously processed in this loop.
- Format root category as XML menu element
- Loop through link data array to follow parent/child links from top to bottom
    - Format link data as XML menu structure and append to XML output
- Continue loop
- Continue loop
- Output XML menu data

ASP script (presentation):

- Call function to process XML menu data generated by middleware and convert to Javascript array expected by third-party menu manager library.
- Within this function:
    - Loop through menu elements at the current level
        - If no menu element has been read, read first menu element, otherwise read next
        - If menu element is the end of a submenu, exit loop.
        - If menu element is the start of a submenu
            - Call this function recursively to process this submenu in the same manner, passing current context to allow sequential processing of XML to continue.
        - If menu element is any other type, convert XML data to javascript array expected by third-party menu manager library.
    - Continue loop
    - Clear benign error code, if any

- Write javascript array data expected by third-party menu manager library.
- End function

User interface:

- User sees a hierarchy of drop-down menus corresponding to all possible routes throught the taxonomy hierarchy to targets associated with the keyword the user entered. Since the web structure of the taxonomy is mapped to the tree structure of the menus, targets having multiple paths will appear more than once. (Will appear once for each unique path through the taxonomy.)

Interactive Engineering Guidelines and Content with Problem Solving Tools

Interneer will have a database of the most widely used guidelines and "rules of thumb" for engineers along with the necessary equations, data and charts. This content will be generated from popular engineering handbooks available in electronic form. Topics will be compiled from surveys conducted on working engineers and will include:

- Guidelines - Engineering workflows compiled from handbooks, standards, specifications and experts
- Technical content - Concise and structured and offered in layers of increasing detail
- Interactive problem solving tools - Interactive equations and explanations of equations
- Reference information - Charts, graphs, tables, constants,

standards, specifications, material properties etc.

- Research and news - Content from popular engineering journals and headlines

Knowledge and Workflow Capture

Interneer provides engineering firms with the ability to also capture their own proprietary processes and guidelines. This way, the knowledge is codified and leveraged, allowing multiple users in an organization to harvest and utilize knowledge that was otherwise only available to the company's experts. This captured knowledge will be available exclusively to them, but will be seamlessly integrated with Interneer's existing knowledge base.

Interneer allows companies to build their own tools and resources and to organize the cumulative knowledge of their engineers. It can then be passed on to new hires and current employees simply and efficiently. Experienced engineers will then be relieved to some extent from training and supervision, allowing them to focus on their core competencies.

E-Journal

This feature tracks users' daily work activities and is an essential time saving tool, given that engineers often refer to their previous work. Elements to the log include:

- Tracking application - Dynamically stores user activities as they solve problems
- Real-time save - Saves instances of their work when

selected

- Online log - Record of pages viewed, equations utilized, data input into equations, etc.

Annotations

Interneer allows engineers to capture knowledge in the form of annotations that can be attached to every page on the server through an annotation engine. This knowledge, which is embodied in engineers' minds and embedded in the processes they use, is immediately captured as they use Interneer. By capturing and codifying annotations, Interneer ensures that knowledge that was once hard to access is now well leveraged, rapidly updated, and easily accessible.

PDA Compatibility

Interneer will create style sheets that are compatible with PDA devices and that will serve HTML pages through the devices' wireless Internet connection. For those users with no wireless Internet connection, mini applications will be made available for download and use on these devices.

Collaboration

Interneer will provide an online project management and collaboration environment, selectively allowing project access control, online file storage and tracking of milestones. In addition, engineers on Interneer will be able to interact with each other virtually to access the same pages and share information.

Future Product Development Plans

Interneer plans to expand its services and functionality by providing real time and online access to suppliers. Upon designing and specifying needed parts, engineers are provided direct access to the providers of these parts as well as experts. As equations are solved online, lists of links to manufacturers of the designed parts are presented along with detailed information, availability / lead-time and cost. Users can purchase needed parts on Interneer.com and directly communicate between their procurement agent and the provider.

Interneer plans to also provide server run applications for Computer Aided Design (CAD), Finite Elements Analyses and Computer Aided Manufacturing (CAM) tools online, available on a pay per use basis. These tools will complete the package making Interneer the complete solution for engineers.

Content Acquisition Criteria

Interneer is selecting initial content for the product based upon our market research, focus groups, and knowledge of target industry needs. Interneer intends to license content from well-known engineering handbooks in order to establish credibility for the software. To help ensure accuracy, Interneer has developed a quality assurance procedure to double-check entries into databases. Interneer will constantly upgrade content and update processes based on new revisions, technical papers, and industry needs. Users will also be able to add content to Interneer's shared database, after the content has been through our extensive review process.

United States Patent & Trademark Office

Office of Initial Patent Examination -- Scanning Division

Application deficiencies found during scanning:

☑ Page(s)_____ of Nonpublication Request were not present for scanning. (Document title)

☐ Page(s)_____ of _____ were not present for scanning. (Document title)

☑ ***Scanned copy is best available.*** Appendix A drawings are very dark.